Service Manual

FILE No.

CO_2 Incubator

MCO-19AIC(UV)

MCO-19AIC

SANYO Electric Co., Ltd.
Biomedical Business Division

SM9910198

Effective models

This service manual is effective following models.

Model name	Model code	Voltage and Frequency	
MCO-19AIC	823 623 51	115V	60Hz
	823 623 53	220V	60Hz
	823 623 54	230/240V	50Hz
MCO-19AIC(UV)	823 623 71	115V	60Hz
	823 623 73	220V	60Hz
	823 623 74	230/240V	50Hz

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- Humidity recovery data (30sec/60sec door open)
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Specifications

■Strucutural specifications

Name	CO_2 Incubator	
Model	MCO-19AIC	MCO-19AIC(UV)
External dimensions	W620 x D710 x H900 mm	
Internal dimensions	W490 x D523 x H665 mm	
Interior volume	170 L	
Exterior	Painted steel	
Interior	Stainless steel containing copper	
Outer door	Painted steel	
Inner door	Temperared glass	
Tray	4 trays, made of stainless steel containing copper Dimensions; W450 x D450 x H12 mm, Maximum load; 7 kg/tray	
Access port	Inner diameter; 30 mm, On the back side	
Insulation	Rigid-polyurethane foamed-in place	
Heating system	DHA system（Heater jacket and air jacket）	
Heater	314 W	
Humidifying system	Natural evaporation with humidifying pan	
Temperature controller	PID control system	
Temperature display	Digital display（Resolution: 0.1°C）	
CO_2 controller	PID control system	
CO_2 density display	Digital display (Resolution: 0.1%）	
Air circulation	Fan assisted	
Air filter	0.3μm, Efficiency: 99.97 % or more	
UV lamp	-————	4 W×1 (Ozone-free emission)
Water level sensor	Optical type	
Alarms	Automatic set temperature alarm, automatic set CO_2 density alarm, Upper limit temperature alarm, Door alarm, Water level alarm, UV lamp failure alarm (UV type only)	
Remote alarm contact	Allowable contact capacity: DC 30 V, 2 A	
CO_2 inlet connection	Diameter; 4～6 mm tube	
CO_2 inlet pressure	0.03 MPaG（0.3 kg/cm^{2}G, 4.3psiG）	
Accessories	4 trays, 4 sets of tray support, 1 gas tube, 1 humidifying pan Stacking plate A and B, 4 protective stickers, 2 tube bands	
Weight	93 kg	
Optional accessories	UV lamp Add-on kit （MCO-19UVS）	(Standard)
	H_2O_2 generator（MCO-HP） H_2O_2 Decontamination kit（MCO-HL） H_2O_2 Decontamination Reagent（MCO-H2O2） Automatic CO_2 standard Gas Calibration Kit（MCO-SG） Gas pressure regulator（MCO-100L） Extra tray（MCO-47ST）including 2 tray supports, Half tray（MCO-25ST）, Automatic CO_2 cylinder changeover system（MCO-21GC） Roller base（MCO-18RB） Communicatons Terminal (MTR-480/MTR-L03)	

■Control specifications

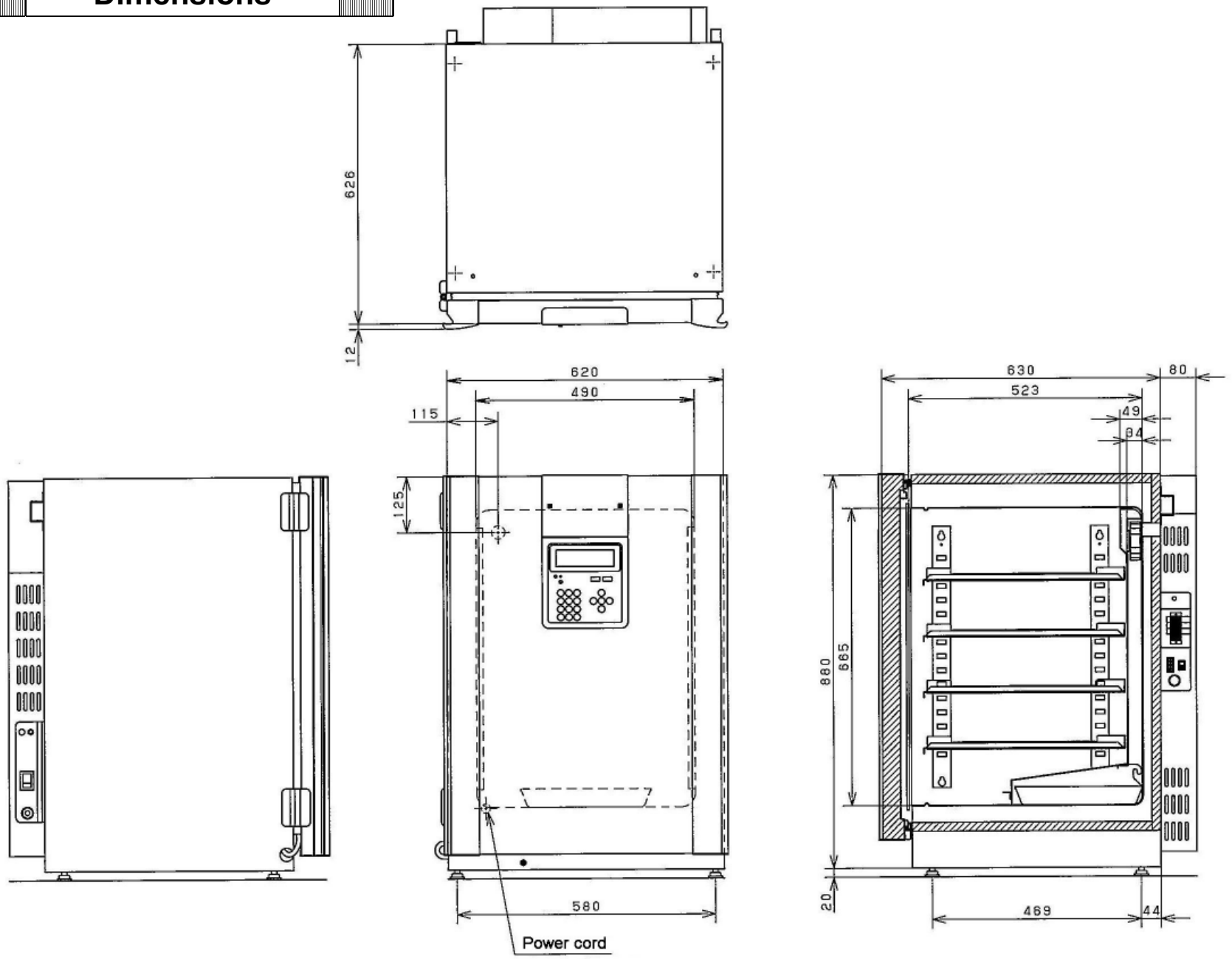
Model	MCO-19AIC	MCO-19AIC(UV)
Thermal sensor	Thermistor	
Temperature display	LCD digital display	
CO_2 controller	Microcomputer; Input by keypad CO_2 density setting range: 0%～20%（Resolution; 0.1%） Non-volatile memory	
CO_2 density display	LCD digital display (Resolution; 0.1%)	
Water level detection	Water level sensor（Optic type）	
Alert function	Digital display and ALARM lamp Remote alarm contact capacity（DC30V, 2A） with buzzer sounds	
H_2O_2 decontamination (Option)	- Supersonic H_2O_2 decontamination - Low density H_2O_2 solution (Oxidor) which can be purchased commonly - Solution level detection by sensor	
Electric lock (Option)	Outer door is locked during H_2O_2 decontamination	
UV system	UV lamp lighting time can be extended automatically (Option for 19AIC)	
Key lock function	Settable by LCD menu	
Self-diagnosis	- Error code and error information are displayed by text. - Remote alarm contact activates with buzzer sounds.	
Power switch	Installed on back side (Internal overcurrent breaker)	

■Performance specifications

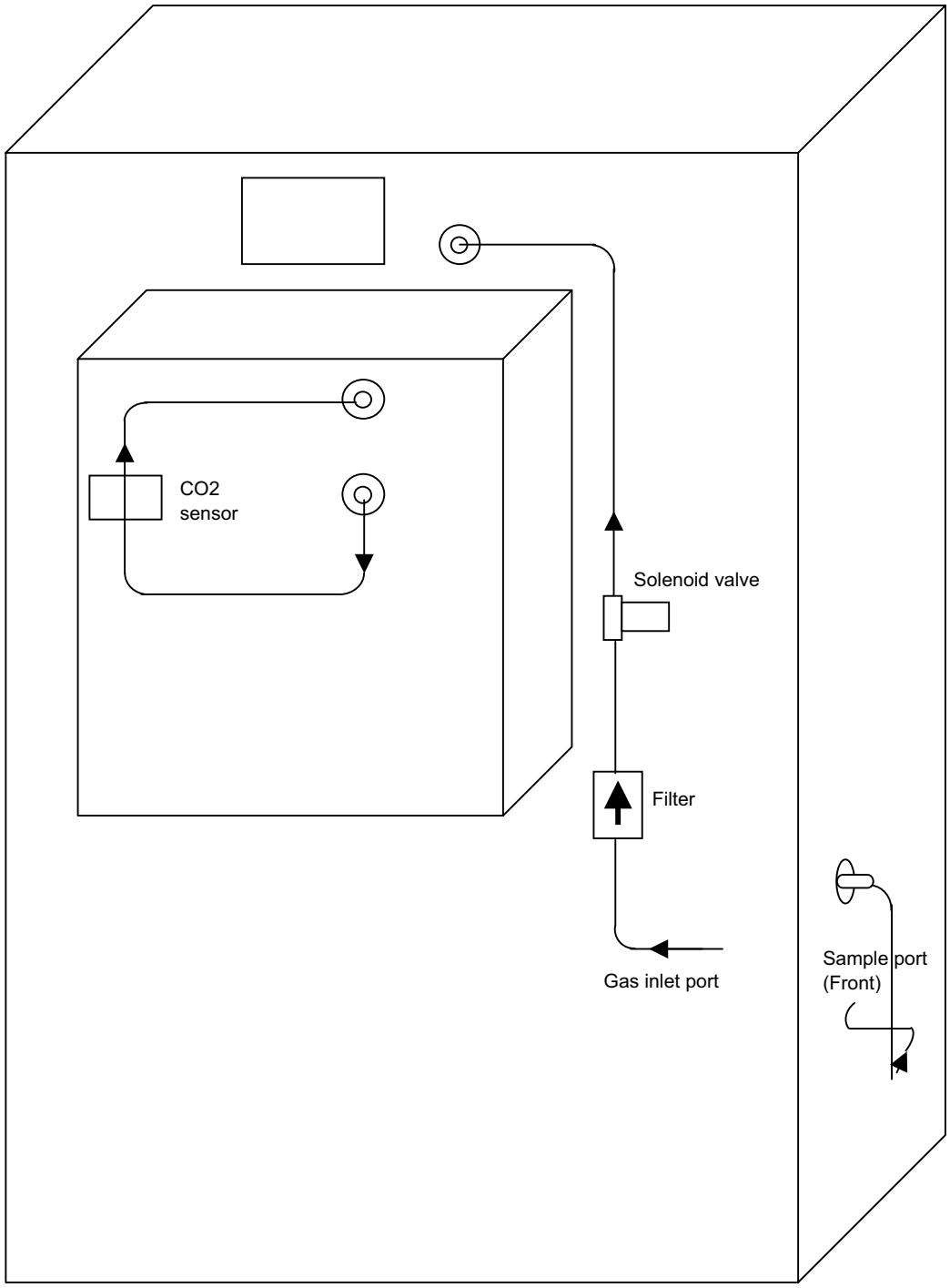
Temperature control range	Ambient temp. +5～50°C（ambient temp; 5～35°C）	
Temperature distribution	±0.25°C（ambient temp; 25°C、setting; 37°C, CO_2 5%, no load）	
Temperature variation	±0.1°C（ambient temp; 25°C、setting; 37°C, CO_2 5%, no load）	
CO_2 control range	0～20 %	
CO_2 variation	±0.15 %（ambient temp; 25°C、setting; 37°C, CO_2 5%, no load）	
Chamber humidity	95±5%R.H.	
Maximum power consumption	350W	310W
Total maximum current	110~120V, 60Hz	220~240V, 50Hz
	2.8A	1.4A
Maximum heat emission	1120 KJ/h	
Applicable environment condition	Temperature: 5～35°C,　Humidity: Equal or less than 80%R.H. （Designed performance may not be obtained when ambient temp. is equal or lower than 15°C）	

Note) Specifications will be subject to change without notice.

Dimensions


626
12
620
490
115
125
580
Power cord
630
523
80
49
84
880
665
20
469
44

Gas circuits



Temperature calibration

Here is the explanation how to calibrate chamber temperature.

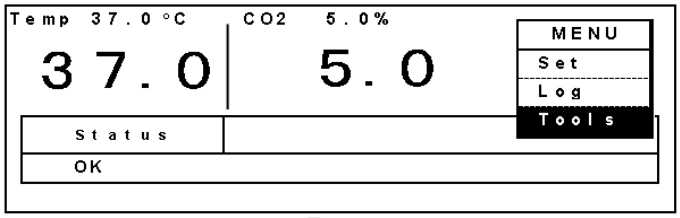
Ex) When setting temperature is 37.0℃ and actual temperature is 36.5℃

Process	Operation	MENU
0	Set thermal sensor at the center of the chamber and start the unit running. Leave it until chamber temperature is stable.	
1	Press MENU key in Top screen to call MENU screen. Select Tools.	Tools
2	Select Tools (1/2) screen is displayed. Select Temp/CO_2 Calibration.	
3	Temp/CO_2 Calibration is displayed and press MENU key to activate MENU key. Select OK and press ENTER key.	OK
4	Change the value in the column Temp Span to **36.5℃** by pressing digit shift key and numerical value shift key.	
5	Press MENU key to call MENU screen. Select OK and press ENTER key.	OK
6	Automatically reverts to Select Tools (1/2) screen.	

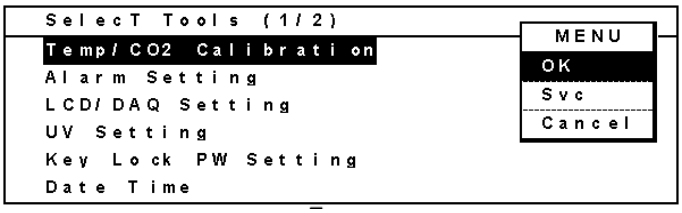
*Note (1) It is important to use an accurate thermal sensor to measure the center of the chamber.

(2) You can input the value between 1.0℃ ~ -1.0℃ to calibrate chamber temperature. When you need to calibrate the value out of the range, you should input the value at several times. Otherwise error tone should be emitted to cancel the data.

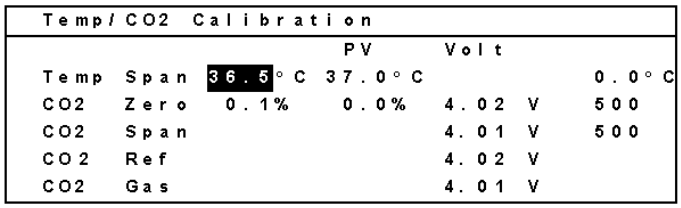
<Display of Process 1>



<Display of Process 3>



<Display of Process 4>



CO_2 calibration

Here is the explanation how to calibrate chamber CO_2 density.

(Ex) When setting CO_2 density is 5.0% and actual CO_2 density is 4.5%:

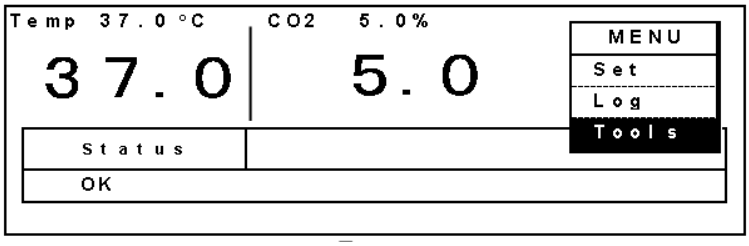
Process	Operation	MENU
0	Put densitometer thorough the sample port at the front side of the unit to measure chamber CO_2 density.	
1	Select Tools in the Top Screen.	Tools
2	Select Tools (1/2) is displayed. Select temp / CO_2 Calibration and press OK key.	OK
3	By pressing digit shift key and numerical value shift key to input actual CO_2 density（4.5%）in the column CO_2 Span. Select OK and press ENTER key.	OK
4	Automatically reverts to Select Tools (1/2) screen.	

*Note (1) Input range is +1.0% ~ -1.0% (per input).

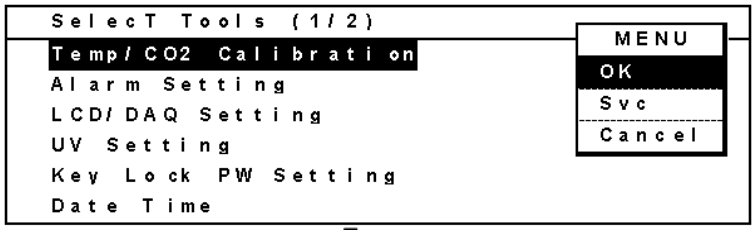
(2) When the displayed CO_2 density does not match with actual CO_2 density, you should try to do calibration by several times.

(3) You can do CO_2 sensor span calibration only when setting CO_2 is 5.0%.

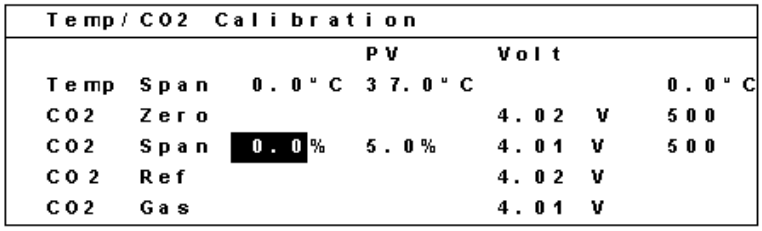
Display of Process-1



Display of Process-2



Display of CO_2 span calibration



CO_2 zero calibration

Prior to do calibration

- Make sure chamber temperature and CO_2 sensor BOX temperature should be 45℃±2℃ and setting CO_2 density is 0.0%. Leave it is until chamber temperature and CO_2 density is stable.
- Make sure there should not be left CO_2 in the chamber.

  * Note) When you do CO_2 re-calibration, make sure there should not be left CO_2 in the chamber with the door opened.

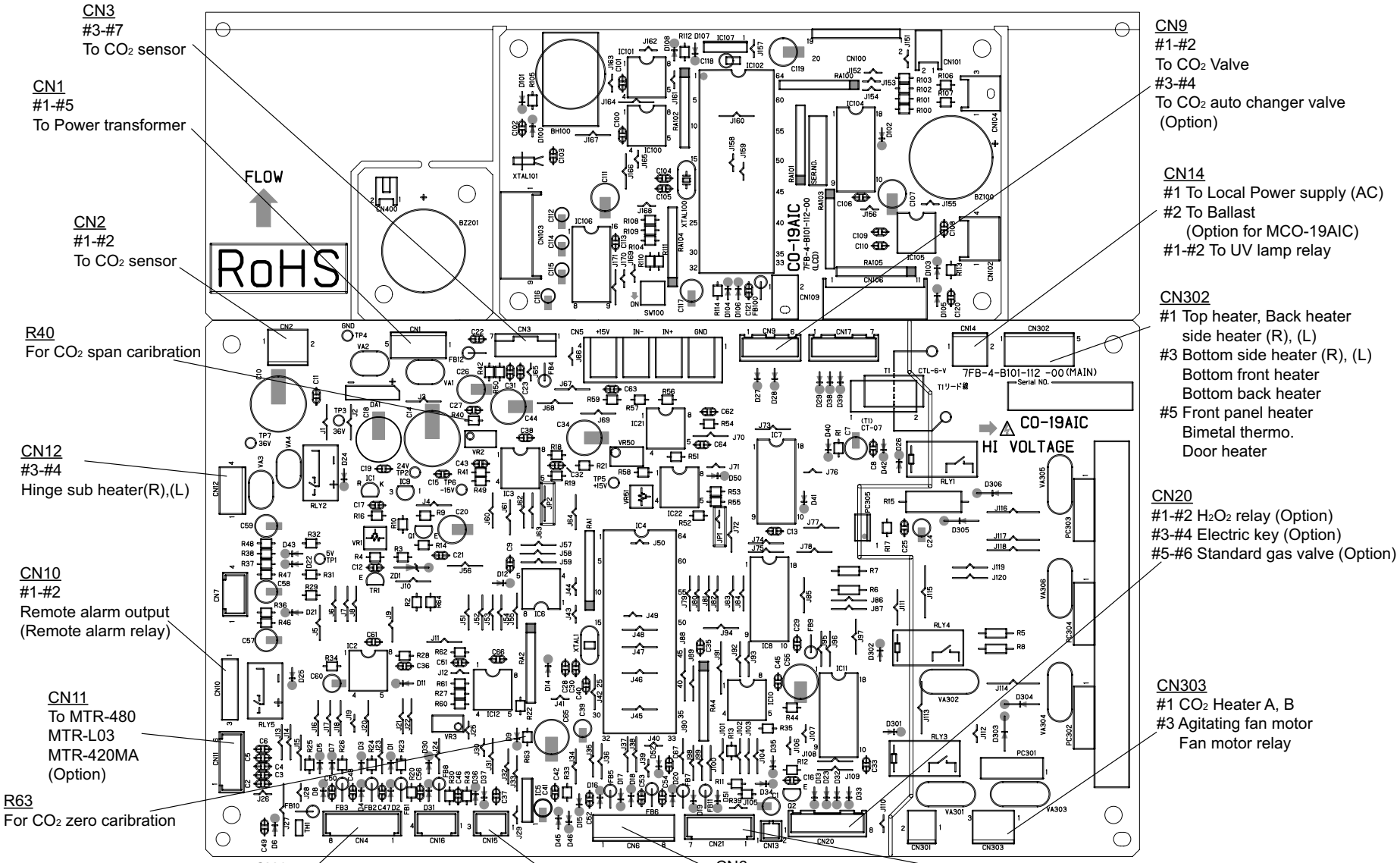
Procedure

1. Call Select Tools screen to display Temp/ CO_2 Calibration.
2. Turn the VR3 around CN15 on the main PCB or measure the voltages both ends of R63 to make **CO_2 sensor reference cell voltage（CO2 Zero）** to 4.00V±0.03V.
3. Turn the VR2 around CN3 on the main PCB or measure the voltages both ends of R40 to make **CO_2 sensor gas cell voltage（CO2 Span）** to 4.00V±0.03V.
4. Input 0.0% by pressing digit shift key and numerical value shift key with 0.1% besides right to the CO2 Zero blackening. (See the picture below)

Temp/CO2 Calibration						
			PV	Volt		
Temp	Span	0.0°C	37.0°C			0.0°C
CO2	Zero	0.1%	0.0%	4.02	V	500
CO2	Span			4.01	V	500
CO2	Ref			4.02	V	
CO2	Gas			4.01	V	

5. Press MENU to call MENU display. Select OK and press ENTER key.

Components on PCB



Connections on PCB

■Connections on Main PCB

Connector	Connects to	Usage
CN1	Power transformer #1 - #2: AC8.5V #3 GND #4, #5 AC18V	To supply the power to PCB
CN2	DC5V power supply #1 - #2:（GND）, DC5V	To supply the power to PCB
CN3	CO_2 sensor	To control CO_2 density
CN4	#1 - #2: Overheat protect sensor #3 - #4: Temp. sensor #5 - #6: CO_2 BOX temp. sensor	To detect temperature in each points
CN6	#1 - #2: Door switch #3 - #6: MCO-HP（Option） #7 - #8: Standard gas switch	To detect door open
CN7	Unused	
CN9	#1 - #2: CO_2 valve #3 - #4: CO_2 Auto changer valve (Option)	To control CO_2 valve ON and OFF
CN10	Remote alarm output #1 - #2: Remote alarm relay 'Open' in normal condition	To output for remote alarm contact
CN11	MTR-480 (Option)	
CN12	#3 - #4: Hinge sub heater (R),(L)	To control hinge sub heater
CN14	UV lamp	
CN20	#1 - #2: H2O2 relay #3 - #4: Electric key #5 - #6: Standard gas valve	
CN21	Control PCB（KEY） Display PCB（LCD）	
CN15	Water sensor	To check water level in humidifying pan

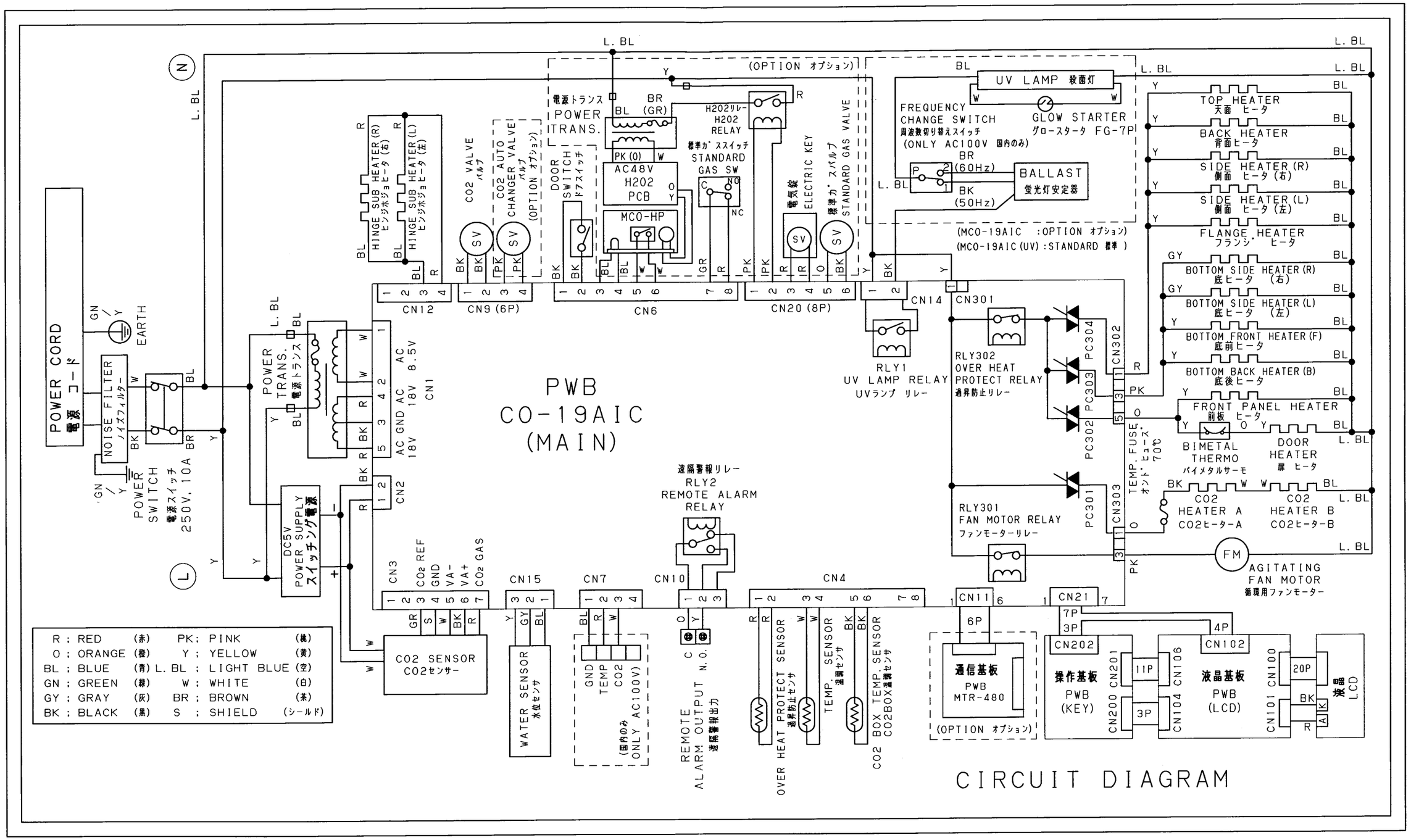
Connector	Connects to	Usage
CN302	#1: Top heater, back heater, side heaters, flange heater #3: Bottom side heaters, bottom front/back heater #5: Front panel heater, bimetal thermo	To control each heater
CN303	#1: Temp. fuse 70℃, CO2 heater A/B #3: Agitating fan motor (Chamber circulating fan motor)	To control sensor BOX temperature To control circulating fan motor

Electric parts

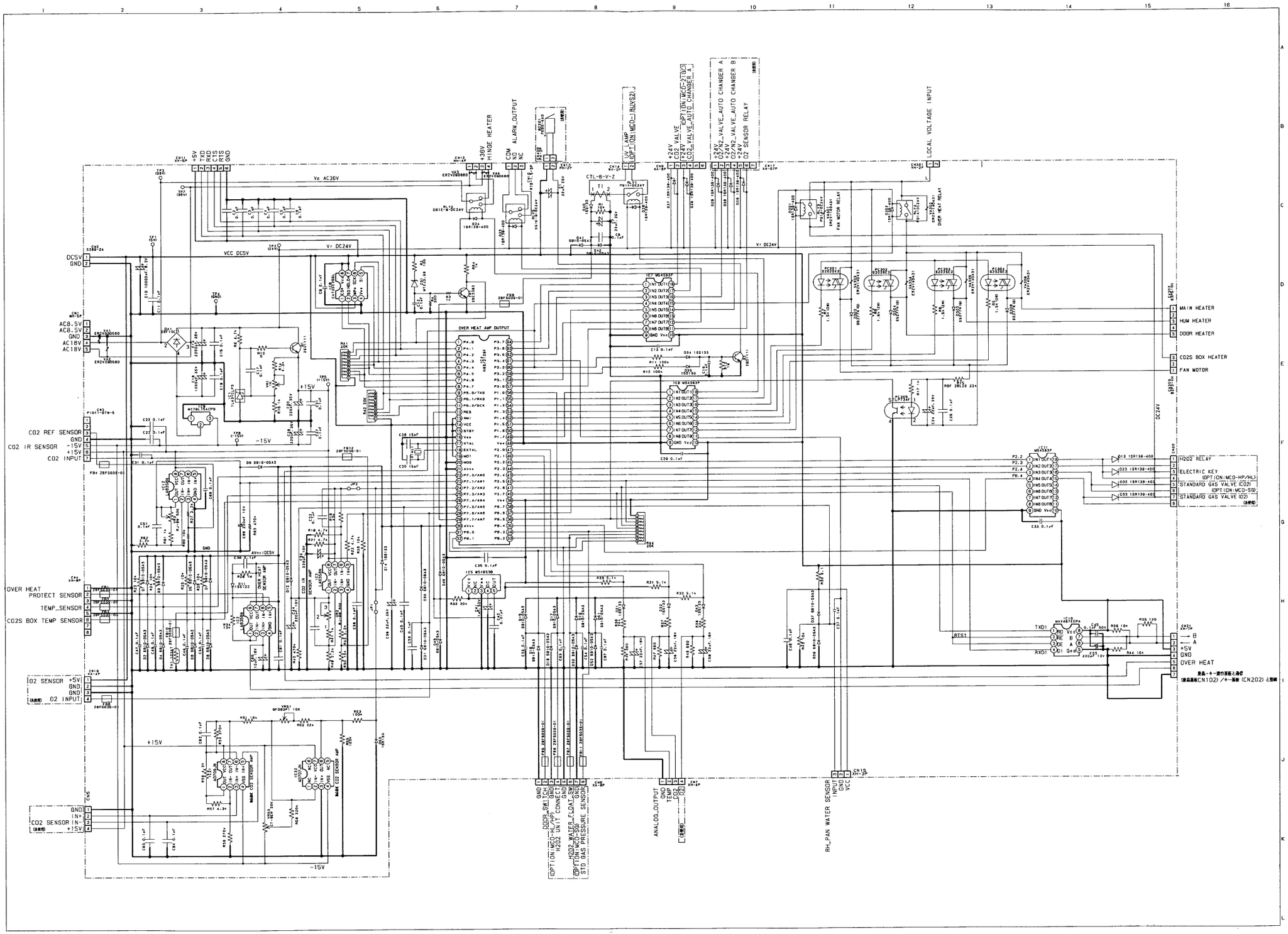
MCO-19AIC/19AIC(UV)		AC115V, 60Hz	AC230/240V, 50Hz	AC220V, 60Hz
Agitating fan motor	Type	FL2-011Y1MP	FL2-011Y5MP	FL2-011Y5MP
	Rating	110-115V	220-240V	220-240V
	Parts code	624 022 3315	924 022 3323	624 022 3322
Fan motor relay	Type	G4F-11123T	G4F-11123T	G4F-11123T
	Coil	DC24V, 20A, 250V	DC24V, 20A, 250V	DC24V, 20A, 250V
Temp. fuse 70℃	Rating	250V, 7A	250V, 7A	250V, 7A
	Parts code	624 227 4483	924 227 4477	624 227 4476
Flange heater	Rating	AC115V, 31W	AC230V, 31W	AC230V, 31W
	Parts code	624 219 5382	924 219 5468	624 219 5467
Door heater	Rating	AC115V, 85W	AC230V, 85W	AC230V, 85W
	Parts code	624 219 5405	924 219 5482	624 219 5481
Bottom front heater	Rating	AC115V, 10.4W	AC230V, 10.4W	AC230V, 10.4W
	Parts code	7FB4H10114701	7FB4H10114702	7FB4H10114702
Bottom front/back heater	Rating	AC115V, 10W	AC230V, 10W	AC230V, 10W
	Parts code	624 219 5375	924 219 5451	624 219 5450
CO2 heater A	Rating	AC71V, 19.5W	AC141V, 19.5W	AC141V, 19.5W
	Parts code	624 227 4391	924 227 4408	624 227 4407
CO2 heater B	Rating	AC45V, 12.5W	AC89V, 12.5W	AC89V, 12.5W
	Parts code	624 227 4421	924 227 4439	624 227 4438
Front panel heater	Rating	AC115V, 37W	AC230V, 37W	AC230V, 37W
	Parts code	624 219 5399	924 219 5475	624 219 5474
Bottom side heater R, L	Rating	AC115V, 14W	AC230V, 14W	AC230V, 14W
	Parts code	624 198 3898	924 198 3905	624 198 3904
Side heater R, L	Rating	AC115V, 30W	AC230V, 30W	AC230V, 30W
	Parts code	624 219 5429	924 219 5437	624 219 5436
Top heater	Rating	AC115V, 8.0W	AC230V, 8W	AC230V, 8W
	Parts code	624 219 5412	924 219 5499	624 219 5498
Back heater	Rating	AC115V, 12W	AC230V, 12W	AC230V, 12W
	Parts code	624 219 5368	924 219 5444	624 219 5443
Hinge sub heater R,L	Rating	AC36V, 0.3W	AC36V, 0.3W	AC36V, 0.3W
	Parts code	624 216 2131	924 216 2132	624 216 2131
CO2 sensor	Type	IR sensor	IR sensor	IR sensor
	Rating	TPS2534	TPS2534	TPS2534
	Parts code	6242298755	9242298756	6242298755
Water sensor	Type	OLS-10003S	OLS-10003S	OLS-10003S
	Rating	5V	5V	5V
	Parts code	624 215 9186	924 215 9187	624 215 9186
Overheat protect sensor	Type	103AT-1	103AT-1	103AT-1
	Rating	10KΩ,25℃	10KΩ,25℃	10KΩ,25℃
	Parts code	6240223254	9240223255	6240223254
Temp. sensor	Type	103AT-1	103AT-1	103AT-1
	Rating	10KΩ,25℃	10KΩ,25℃	10KΩ,25℃
	Parts code	6240223261	9240223262	6240223261
CO2 BOX temp. sensor	Type	103AT-1	103AT-1	103AT-1
	Rating	10KΩ,25℃	10KΩ,25℃	10KΩ,25℃
	Parts code	6241838983	9241838984	6241838983

MCO-19AIC/19AIC(UV)		AC115V, 60Hz	AC230V, 50Hz	AC220V, 60Hz
Ballast (Option for MCO-19AIC)	Type	EKF-04115B1	EKF-04115B1	EKF-04115B1
	Rating	115V, 4W	115V, 4W	115V, 4W
	Parts code	7FB4L502022021	7FB4L502022021	7FB4L502022021
UV lamp (Option for MCO-19AIC)	Type	GL4	GL4	GL4
	Rating	4W	4W	4W
	Parts code	624 215 8257	924 215 8258	624 215 8257
Glow starter (Option for MCO-19AIC)	Type	FG-7P	FG-7P	FG-7P
	Parts code	624 006 5281	924 006 5282	624 006 5281
Power transformer	Type	ATR-HN231UT	ATR-HN235T	ATR-HN235T
	Rating	8.5V, +/-18V	8.5V, +/-18V	8.5V, +/-18V
	Parts code	624 199 4405	924 199 7520	624 199 7529
Power supply DC5V	Type	ZWS15-5/J	ZWS15-5/J	ZWS15-5/J
	Output	5V, 3A	5V, 3A	5V, 3A
	Rating	624 219 4781	924 219 4782	624 219 4781
Power switch	Type	BAM210131	BAM210131	BAM210131
	Rating	AC250V, 10A	AC250V, 10A	AC250V, 10A
	Parts code	624 219 5023	924 219 5024	624 219 5023
Door switch	型式	SS160-A15	SS160-A15	SS160-A15
	定格	28V, 50MA	28V, 50MA	28V, 50MA
	部品コード	624 197 1925	924 197 1926	624 197 1925
Noise filter	Type	ZHG2210-11S	ZHG2210-11S	ZHG2210-11S
	Rating	AC250V, 10A	AC250V, 10A	AC250V, 10A
	Parts code	624 204 2822	924 204 2823	624 204 2822
CO2 valve	Type	FAB11-X2265	FAB11-X2265	FAB11-X2265
	Rating	DC24V	DC24V	DC24V
	Parts code	624 205 7703	924 205 7704	624 205 7703
CO2 auto changer valve (MCO-21GC) <Option>	Type	FAB11-X2265	FAB11-X2265	FAB11-X2265
	Rating	DC24V	DC24V	DC24V
	Parts code	624 205 7703	924 205 7704	624 205 7703
Power transformer (MCO-HL) <Option>	Type	ATR-R502V	ATR-R502V	ATR-R502V
	Rating	115V	230V	230V
	Parts code	7FB0W30136301	7FB0W30136302	7FB0W30136302
H2O2 relay (MCO-HL) <Option>	Type	G2R-1A-T	G2R-1A-T	G2R-1A-T
	Rating	24V, 10A, 250V	24V, 10A, 250V	24V, 10A, 250V
	Parts code	624 184 1792	924 184 1793	624 184 1792
Standard gas switch (MCO-SG) <Option>	Type	SPS-35	SPS-35	SPS-35
	Rating	5KPA	5KPA	5KPA
	Parts code	624 230 8027	924 230 8028	624 230 8027
Electric key (MCO-HL) <Option>	Type	LE-36	LE-36	LE-36
	Rating	DC24V	DC24V	DC24V
	Parts code	624 230 8034	924 230 8035	624 230 8034
Bimetal thermo.	Type	TH-2U	TH-2U	TH-2U
	Rating	ON:60℃ OFF:70℃	ON:60℃ OFF:70℃	ON:60℃ OFF:70℃
	Parts code	624 219 5030	924 219 5031	624 219 5030

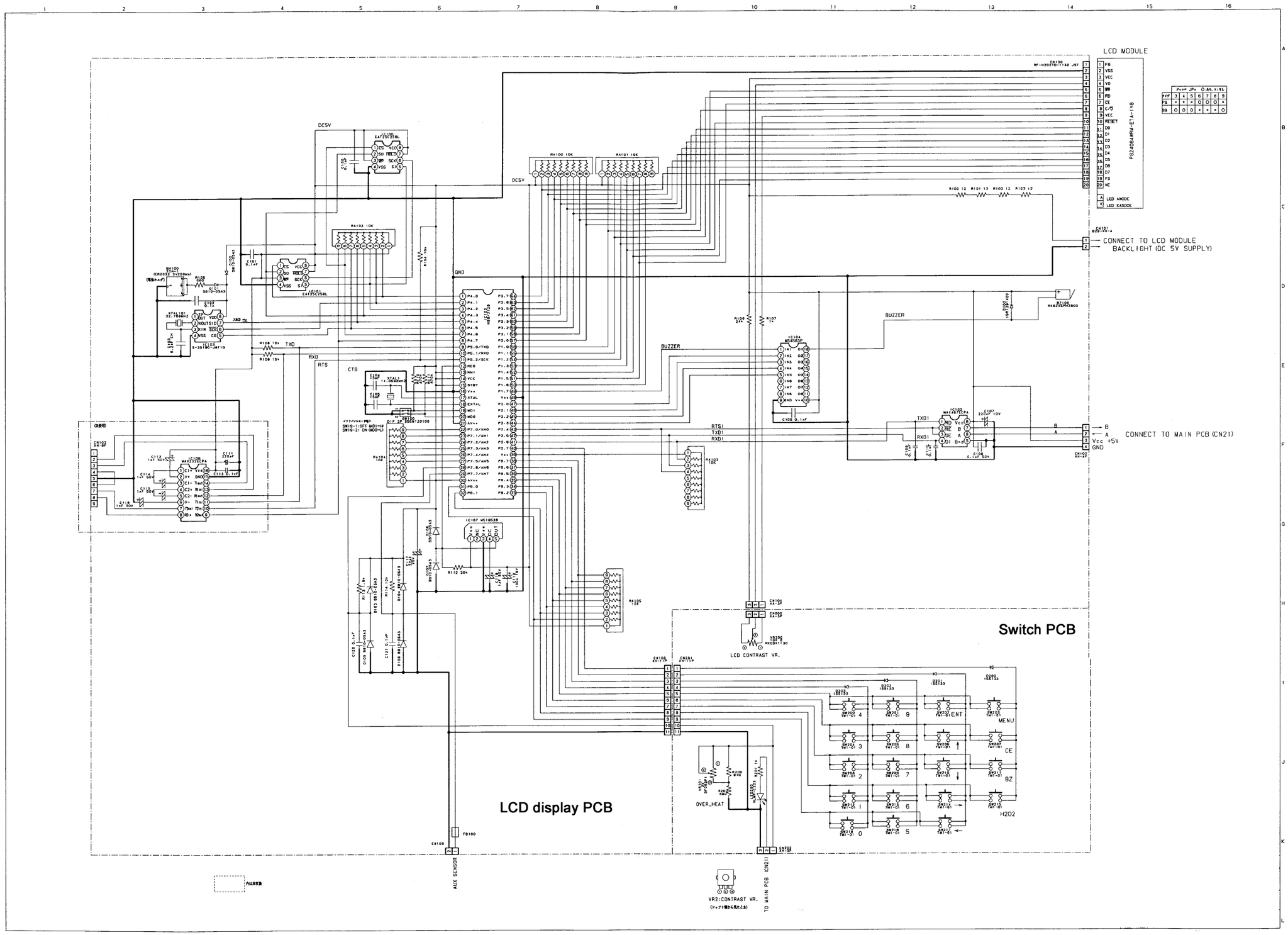
Wiring Diagram



Main PCB diagram



LCD PCB diagram



Control specifications

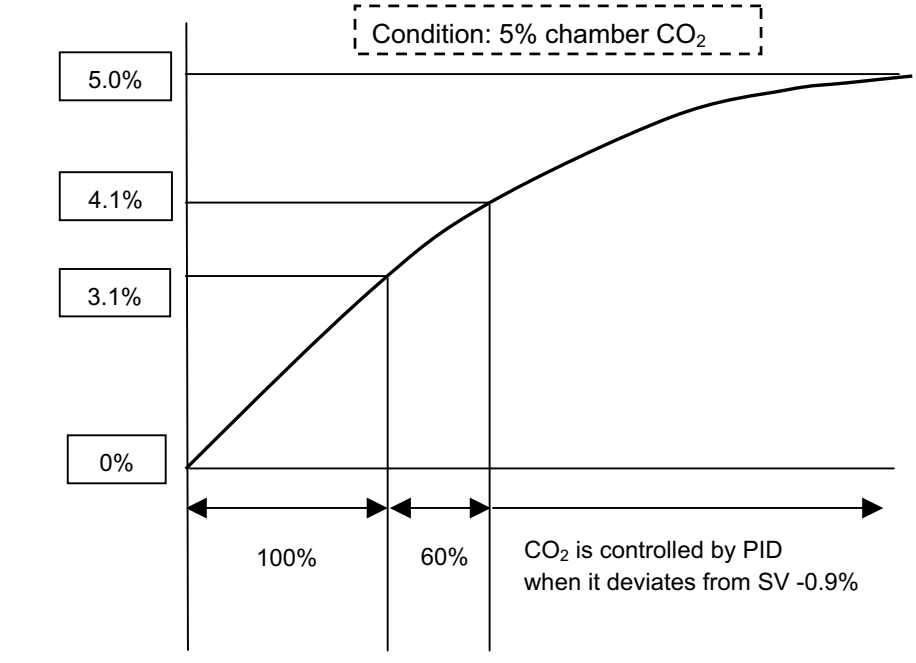
1. Temperature control

Setting range	:	0°C ~ +50°C
Display range	:	0°C ~ +99.9°C
Temperature setting	:	In Top screen, press MENU key to show menu window. Select 'SET' and press ENTER key. Set parameter by digit key and press MENU key. Select 'OK' and press ENTER key to memorize the value.
Unacceptable setting:		When you try to set value out of range and press ENTER key, buzzer sounds for 1 second to inform the value is unacceptable to set.
Control	:	PID control
When unit warms up:		PID controls activates when chamber temperature deviates from set temperature by -1.7°C.
Alarm	:	Setting range is changeable. When chamber temperature deviates from set temperature +/-1°C (default), display digits blink. Buzzer and remote alarm activate with 15minutes delay (default).

2. CO_2 control

Setting range	:	0% ~ 20.0%
Display range	:	0% ~ 99.9%
Alarm range	:	Setting density +/-1.0%
Alarm delay time	:	15 minutes
CO_2 setting	:	In Top screen, press MENU key to show menu window. Select 'SET' and press ENTER key. Set parameter by digit key and press MENU key. Select 'OK' and press ENTER key to memorize the value.
Unacceptable setting:		When you try to set value out of range and press ENT key, buzzer sounds for 1 second to inform the value is unacceptable to set.
Uncontrollable CO_2 Density	:	When you set CO_2 density in 0.0%, CO_2 is uncontrollable and CO_2 display is gone off.
Alarm	:	Setting range is changeable. When chamber temperature deviates from set temperature +/-1% (default), display digits blink. Buzzer and remote alarm activate with 15minutes delay (default).
Control	:	PID control

CO_2 density control

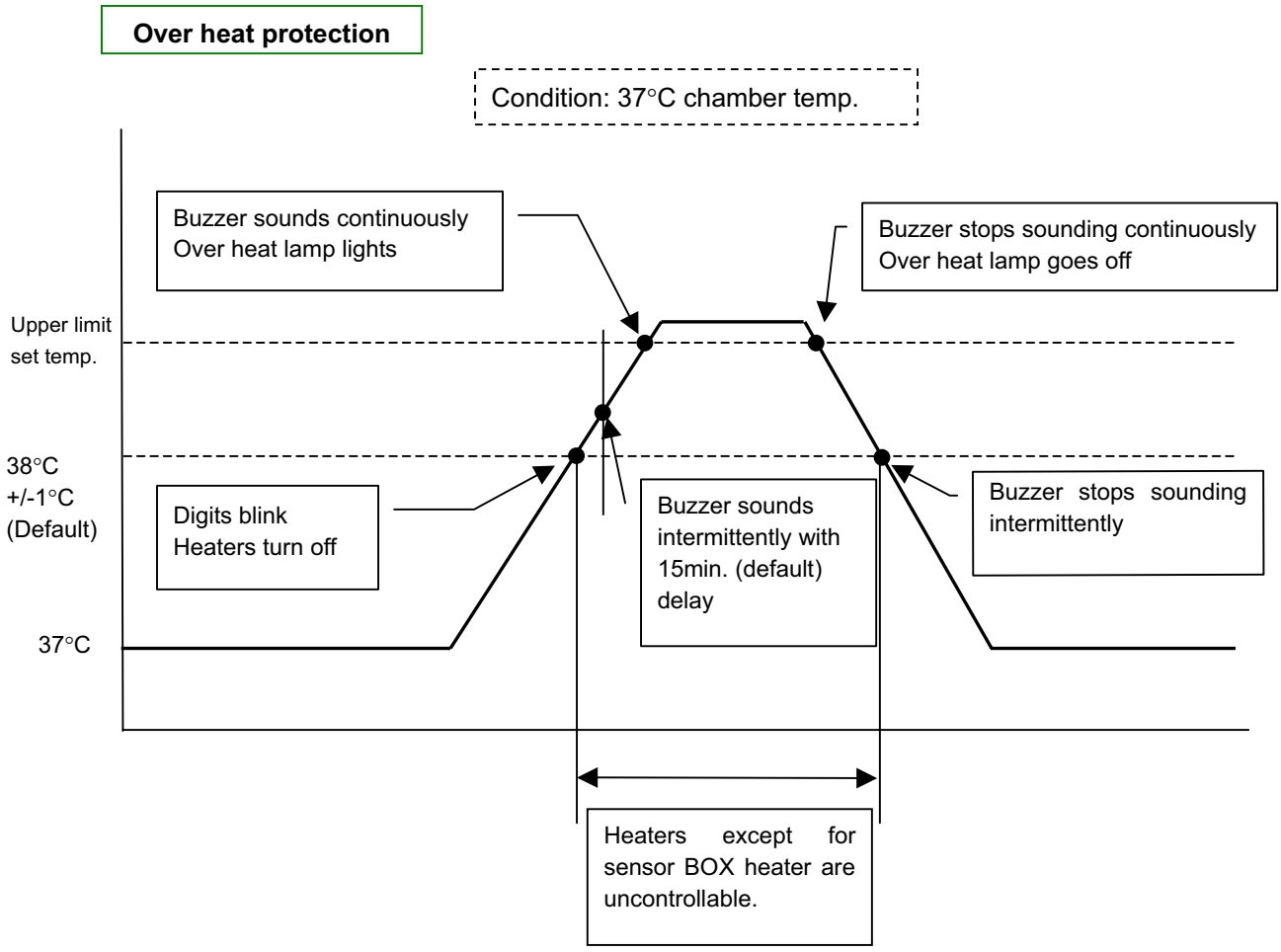


3. Upper limit temperature

Setting range : +33. 5°C～+52.3°C (Upper and lower limits varies on PCB)

Temperature setting: In Top screen, press MENU key to show menu window. Set parameter by turning volume (VR201) on the display PCB.
You can check the value in 'High Limit' display.
Press MENU key and select OK. Press ENTER key to memorize the value.
(Note) Setting value would be changed once you turn the volume (VR101), even though 'High Limit' is not displayed.

The unit has the sensor for over heat protection additionally to the temp. control sensor. The unit is protected from over heating by the analog circuit if the micro-computer fails.



4. Alarms, safety functions and self diagnosis functions

The unit has self diagnosis function to display an error code if the unit malfunctions.
A safety function activates simultaneously.
In sensors malfunctions and CO_2 control malfunctions, an error code and chamber temperature are displayed alternately.
(Note) The remote alarm activates immediately except during in Auto Zero.
So it would have maximum 4minutes of delay to activate remote alarm contact after an error is displayed.

Error codes

Error	Message	Status	Buzzer operation	Remote alarm contact	Safety operation
Err 01	CO2 Gas Empty	CO_2 gas is empty. (CO_2 density does not increase 0.2% or more in 1 minute with valve open)	Intermittent	Activates	CO_2 valve will close
Err 05	Temp sensor Open	Temp sensor is disconnected.(Temp. input by microcomputer is equal or less than 0℃)	Intermittent	Activates	Heater OFF
Err 06	Temp sensor Short	Temp sensor is short circuited.(Temp. input by microcomputer is equal or more than 60℃)	intermittent	Activates	Heater OFF
Err 07	CO2 Box Temp Sensor Open	CO_2 sensor BOX temp sensor is disconnected.(Temp. input by micro-computer is equal or less than 0℃)	Intermittent	Activates	CO_2 valve will close
Err 08	CO2 Box Temp Sensor Short	CO_2 sensor BOX temp sensor is short circuited.(Temp. input by micro-computer is equal or more than 60℃)	Intermittent	Activates	CO_2 valve closed
Err 09	At Sensor Open	AT sensor is disconnected.(Temp. input by micro-computer is equal or less than 0℃)	Intermittent	Activates	Fail-safe mode will assume ambient as 25℃.
Err 10	At Sensor Short	AT sensor is short circuited.(Temp. input by micro-computer is equal or more than 60℃)	Intermittent	Activates	Activates with regarded as AT is 25℃.
Err 11	CO2 Sensor Vref abnormal	CO_2 sensor Vref voltage is abnormal. (A/D input voltage in CO_2 sensor Vref is equal or less than 3.0V, or equal or more than 4.8V)	Intermittent	Activates	CO_2 valve will close
Err 12	CO2 Sensor Vgas abnormal	CO_2 sensor Vgas voltage is abnormal. (A/D input voltage in CO_2 sensor Vgas is equal or less than 1.0V, or equal or more than 4.8V)	Intermittent	Activates	CO_2 valve will close
Err 13	Main Heater abnormal	Main heater is abnormal.(Main heater is disconnected or Main heater SSR is short circuited)	Intermittent	Activates	-----
Err 14	Humidity Heater abnormal	Bottom heater is abnormal.(Bottom heater is disconnected or Bottom heater SSR is short circuited)	Intermittent	Activates	-----
Err 15	Door Heater abnormal	Door heater is abnormal.(Door heater is disconnected or bottom heater SSR is short circuited)	Intermittent	Activates	-----
Err 16	CO2S Box Heater abnormal	CO_2 sensor BOX heater is abnormal. (CO_2 sensor BOX heater is disconnected or CO_2 sensor BOX heater SSR is short circuited)	Intermittent	Activates	-----
Err 17	SSR Open	SSR for Main heater or Bottom heater or Door heater is disconnected.	Intermittent	Activates	-----
Err 18	UV lamp abnormal	UV lamp is disconnected.(UV lamp malfunction or UV lamp circuit is abnormal)	Intermittent	Activates	UV decontamination time is changed from 90min. to 270min.
-----	Warning: High Temp.	High temp. alarm (Chamber temp deviates from high temp alarm setting range and alarm delay time elapses)	Intermittent tone with delay	Activates with 0~15min. delay	Temp display blinks and buzzer sounds
-----	Warning: Low Temp.	Low temp. alarm (Chamber temp deviates from low temp alarm setting range and alarm delay time elapses)	Intermittent tone with delay	Activates with 0~15min. delay	Temp display blinks and buzzer sounds
-----	Warning: High CO2 Density	High CO_2 density alarm (Chamber CO_2 density deviates from high CO_2 density alarm setting range and alarm delay time elapses)	Intermittent tone with delay	Activates with 0~15min. delay	CO_2 display blinks and buzzer sounds
-----	Warning: Low CO2 Density	Low CO_2 density alarm (Chamber CO_2 density deviates from low CO_2 density alarm setting range and alarm delay time elapses)	Intermittent tone with delay	Activates with 0~15min. delay	CO_2 display blinks and buzzer sounds
-----	Main heater Abnormal CO2S Box Heater Abnormal	Overheat alarm (Chamber temp deviates from upper limit temp alarm setting range)	Continuous tone	Activates	Heater OFF
-----	RH PAN	Low water level in humidifying tray (Water is less than 600ml)	-----	-----	-----

Err 01 : CO_2 gas cylinder is likely empty
With CO_2 valve open and CO_2 density does not increased by 0.2% in 1 minute, 'Err01 CO2 Gas Empty' is displayed and buzzer sounds intermittently.
The unit repeats operation twice so it takes approximately 2minutes to display the message after the cylinder becomes empty.

Note) Err 01 is also displayed when the display for CO_2 density does not change when the unit fails to detect CO_2 density. You should check the amount of CO_2, the status of CO_2 valve and connection between CO_2 cylinder and unit.

Err 05/06: Temp. sensor abnormality (disconnected / short circuit)
When the micro-computer detects chamber temperature is 0°C or lower, it is judged as 'disconnected' displaying "Err05 Temp sensor Open" with intermittent buzzer sounds.
When the micro-computer detects chamber temperature is +60°C or higher, it is judged as 'short circuited' displaying "Err06 Temp sensor Short" with intermittent buzzer sounds. All heaters except for CO_2 sensor BOX heater turn off.

Note) In Err 05 and 06, displayed chamber temperature is different from actual temperature

Err 07/08: CO_2 sensor box temperature abnormality (disconnected / short circuited)
When the micro-computer detects sensor box temperature as 0°C or lower, it is judged as 'disconnected' displaying "Err07 CO2 sensor Open" with intermittent buzzer sounds.
When the micro-computer detects sensor box temperature as +60°C or higher, it is judged as 'short circuited' displaying "Err08 Temp sensor Short" with intermittent buzzer sounds.
Sensor BOX heater is not electrified.

Note) In Err07 or 08 is displayed , CO_2 valve is 'Closed'.

Err 09/10: AT sensor abnormality (disconnected / short circuit)
When the micro-computer detects ambient temperature as 0°C or lower, it is judged as 'disconnected' displaying 'Err09 AT sensor Open' with intermittent buzzer sounds.
When the micro-computer detects an ambient temperature as +60°C or higher, it is judged as 'short circuit' displaying "Err10 AT sensor Short" with intermittent buzzer sounds.

<Sensor errors and error codes>

	Open circuit	Short circuit
Sensor conditions	0°C or lower 27.3KΩ or more	60°C or higher 3.0KΩ or less
Temp. control sensor	Err 05	Err 06
CO_2 sensor BOX sensor	Err 07	Err 08
AT sensor (Ambient)	Err 09	Err 10

Err 11 : CO_2 sensor output voltage abnormality (Vref)
When CO_2 sensor box temperature is stable without high / low temperature alarm activation and CO_2 sensor output voltage is lower than 3000mV or higher than 4800mV, it is judged that CO_2 sensor is abnormal. 'Err11 Sensor Vref abnormal' with buzzer sounds intermittently. CO_2 valve is closed.
You can detect sensor output voltage on both leads of R13 on the control PCB.

- When chamber temperature is set at 45°C or lower, sensor BOX temperature is controlled at 45°C.
- When chamber temperature is set at 45°C or higher, sensor BOX temperature is controlled at 50°C.

Err 12 : CO_2 sensor output voltage abnormality (Vgas)
When CO_2 sensor box temperature is stable without high / low temperature alarm activation and CO_2 sensor output voltage is lower than 3000mV or higher than 4800mV, it is judged that CO_2 sensor is abnormal. 'Err12 Sensor Vgas abnormal' with buzzer sounds intermittently. CO_2 valve is closed.
You can detect sensor output voltage on both leads of R13 on the control PCB.

- When chamber temperature is set at 45°C or lower, sensor BOX temperature is controlled at 45°C.
- When chamber temperature is set at 45°C or higher, sensor BOX temperature is controlled at 50°C.

Err 13 : Main heater abnormality
When upper limit temperature alarm activates or main heater is disconnected or main heater SSR is short circuited, "Err13 Main Heater Abnormal" is displayed with buzzer sounds intermittently.
Self diagnosis is done every 40 minutes so error message is not displayed immediately after failure.

Err 14 : Bottom heater abnormality
When the bottom heater is disconnected or bottom heater SSR is short circuited, 'Err 14 Bottom Heater Abnormal' is displayed with buzzer sounds intermittently.
Self diagnosis is done every 40 minutes so error message is not displayed immediately after failure.

Err 15 : Door heater abnormality
When the door heater is disconnected or bottom heater SSR is short circuited, 'Err 15 Door Heater Abnormal' is displayed with buzzer sounds intermittently.
Self diagnosis is done every 40 minutes so error message is not displayed immediately after failure.

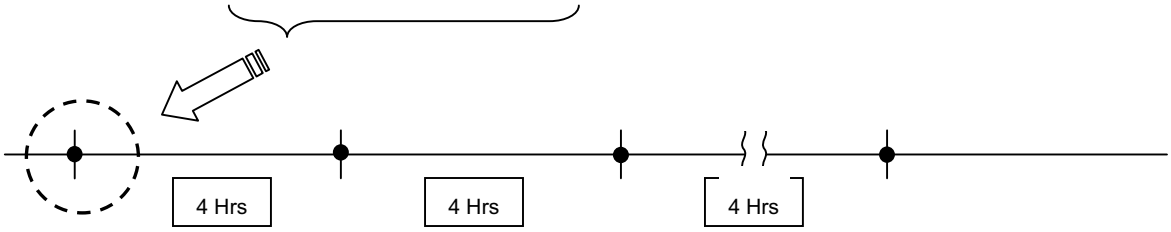
Err 16 : CO_2 sensor box heater abnormality
When CO_2 sensor BOX heater is disconnected or CO_2 sensor BOX heater SSR is short circuited, 'Err 16 CO2S box Heater Abnormal' is displayed with buzzer sounds intermittently.
Self diagnosis is done every 40 minutes so error message is not displayed immediately after failure.

Err 17 : SSR is disconnected
When any SSR of main heater, bottom heater, door heater, CO_2 sensor box heater is disconnected, 'SSR Open' is displayed and buzzer sounds intermittently.

Err 18 : UV lamp abnormality (UV lamp is an optional accessory)
When the UV lamp lighting time (UV Timer; 5) is set, the microcomputer checks the output voltage in UV detection circuit during 25~29seconds after the door was closed. If the voltage is higher than 50mV, it counts as "+" and counts as "-" if lower. After 30 seconds has elapsed then, the microcomputer checks the voltage again. It judges as "UV lamp operative" if the value comes to "+" and judged as "UV lamp malfunction" if the value comes to "-". "Err 18 UV Lamp Abnormal" is displayed with the buzzer sounds intermittently. Press BUZZER key to cancel the error.
When the door is open before the microcomputer checks the output voltage, it does not perform UV lamp checks.

Diagnosis for heaters and SSR

	Check item	Heater status	Diagnosis
1	All heaters ON		Err17: Heater is short circuited or SSR is disconnected when all heaters are ON and inspection port is OFF
2	Main Heater OFF		Err13: Main heater is disconnected or SSR is short circuited when Main heater is OFF and inspection port is ON.
3	Bottom heater OFF		Err14: Bottom heater is disconnected or SSR is short circuited when Bottom heater is OFF and inspection port is ON.
4	Door/Front panel heater OFF		Err15: Door heater is disconnected or SSR is short circuited when Door heater is OFF and inspection port is ON
5	CO_2 sensor BOX heater OFF		Err16: CO_2 sensor BOX heater is disconnected or SSR is short circuited when CO_2 sensor BOX heater is OFF and inspection port is ON.



Note) Forcibly energized every 4 hours to check operations for heaters and SSR.

Upper limit temperature alarm:

When chamber temperature exceeds upper limit temperature alarm set value, OVER HEAT lamp is lit and “Err13 Main heater Abnormal” or “Err16 CO2 sensor BOX heater Abnormal” is displayed with buzzer sounds continuously. Buzzer does not stop sounding even when BUZZER key is pressed.
Main heater, bottom heater and door heater are forced off.

Automatic set temperature alarm

When chamber temperature deviates from alarm setting range (+/-1.0~5.0°C), “Warning High Temp” or “Warning Low Temp” is displayed the buzzer sounds with delay (0~15minutes). Alarm will turn off when chamber temperature is within alarm setting range.

Automatic set CO_2 density alarm

When CO_2 density deviates from alarm setting range (+/-0.5~5%), “Warning High CO2 Density” or “Warning Low CO2 Density” is displayed and the buzzer sounds with delay (0~15minutes). Alarm will turn off when CO_2 density is within alarm setting range.

Automatic set temperature/CO_2 density alarm

Alarm	Message	Description
Low temp.	Warning: Low Temp	Chamber temp is less than alarm set temp and alarm delay time elapses.
High temp.	Warning: High Temp	Chamber temp is more than alarm set temp and alarm delay time elapses.
High CO_2 density	Warning: High CO2 Density	Chamber CO_2 density is more than alarm set density and alarm delay time elapses.
Low CO_2 density	Warning: Low CO2 Density	Chamber CO_2 density is less than alarm set density and alarm delay time elapses

5. CO_2 control

CO_2 sensor BOX temperature:

CO_2 sensor BOX temperature is regarded as correct when chamber temperature is 45.0+/-2.0°C.

CO_2 sensor BOX temperature will control at 50°C when set temperature is more than 45.0°C.

CO_2 injection:

Unit does not start CO_2 injection until 20 minutes has expired after CO_2 sensor box temperature reaches 45.0+/-2.0°C.

Set temperature	Present chamber temp.	CO_2 sensor BOX set temp.
0.0~44.9°C	Equal or less than 46.0°C	45.0°C
45.0~50.0°C	Equal or more than 46.0°C	50.0°C

6. UV lamp automatic operation

If the door is not opened for 12 hours since the last UV lamp operation, UV lamp is automatically illuminated at the period specified by UV timer to prevent bacteria reproduction.

7. UV lamp extra operation

UV lamp operation time is determined by accumulated illumination.

Accumulated illumination time	Extra operation ratio
0~200 hrs	+0%
200~400 hrs	+20%
400~600 hrs	+40%
600~800 hrs	+60%
800~1000 hrs	+80%
1000h~	+100%

<Calculation>

UV lamp operation time = UV lamp set time + (UV lamp set time x extra operation ratio)

(Ex.) UV lamp set time; 5 minutes UV lamp accumulating time; 900 hrs

5 minutes + (5 minutes x 80%) = 9 minutes

8. Key lock function

How to activate: In 'Key Lock' display, change the digit from '0' to '1' and press MENU key. Select 'OK' and press ENTER key.

In Stand-by Setting screen, you can see 'Key Lock' in the upper right corner. You cannot change chamber temp/CO_2 setting value even when you press numerical key.

Unit keeps 'Key lock' when you press MENU key and press ENTER key with 'OK' indicated.

Note) Key lock is not activated when you press 'Cancel' in MENU screen after you set '1' in Stand-by Setting screen.

How to cancel: In 'Key Lock' display, change the digit from '1' to '0' and press ENTER key. You can see 'Password' is displayed at right side of 'Key Lock'.

Input password and press ENTER key. The digit is changed to '0' with an audible 'beep'. Press MENU key and select 'OK' and press ENTER key to cancel Key Lock.

Note) Key lock is still activated when you press 'Cancel' in MENU screen after you set '0' in Stand-by Setting screen.

Operation when password is incorrect: 'Password' is displayed again with the buzzer beeps for 1.5 seconds.

How to recall password: Step into 'Select Tools Svc' and 'Analog Calibration etc', input '101' in the right side of 'Function'. Press ENTER key to display password. (Default: 0000)

9. Door alarm

Indication : When the door is open, 'Door: Open' is highlighted in the right corner of 'Status'.
When the door is closed, there will be no indication in the right corner of 'Status'.

Safety action : When the door is open, fan motor will turn off, CO_2 valve will shut off, UV lamp will turn off if this option is installed, and heater turns off after the door is open for 60 seconds.

10. Auto return

Function : In setting mode, Key Lock mode and Function mode, if any key is not operated for 90 seconds or more, the display automatically reverts to Top screen without the value being memorized.

11. Calibration

<How to calibrate chamber temp>

1. In Top screen, press MENU key and select Tools. Press ENTER key to display 'Select Tools (1/2)'.
2. Select 'Temp/CO2 Calibration' and press ENTER key to display Temp/CO2 calibration screen. Input measured chamber temperature into '0.0°C' beside 'Temp Span'.
3. Select 'OK' in MENU screen and press ENTER key to calibrate chamber temperature automatically.
4. Repeat the procedure until the display temperature corresponds to actual.

Note) Input range is display temperature +/-1.0°C.

<Ex> Set temperature is 37.0°C and actual temperature is 36.5°C

Process	Operation	MENU
0	Place temp. sensor in the center of chamber. Start the operation and leave it until temperature is stable.	
1	In Top screen, press MENU key and select Tools and press ENTER key.	Tools
2	In Select Tools (1/2) screen, select Temp/CO2 Calibration.	
3	Press MENU key and select 'OK' and press ENTER key.	OK
4	In Temp/CO2 Calibration screen, set 36.5°C in Temp Span.	
5	Press MENU key and select 'OK' and press ENTER key.	OK
6	Automatically reverts to Select Tools (1/2) screen.	

<How to calibrate CO_2 density>

CO_2 zero calibration:

Note) Ensure there is no CO_2 in the chamber. Turn off CO_2 supply and fan door to remove if necessary

1. Turn the unit on and leave it until chamber temperature is stable, CO_2 sensor box temperature is 45+/-2°C and CO_2 setting value is 0.0%.
2. In Select Tools (1/2) screen, select 'Temp/CO2 calibration' and turn the potentiometer, VR3 on the PCB to adjust CO_2 sensor reference cell voltage to 4.00V+/-0.03V.
3. Turn the potentiometer VR2 on the PCB to adjust CO_2 sensor gas cell voltage to 4.00V+/-0.03V.
4. Input '0.0' with the display '0.1%' at right side of 'CO2 Zero' highlighted.
   Press MENU key and select 'OK' and press ENTER key start CO_2 zero calibration.
   CO_2 sensor zero point standard voltage is memorized and displayed in 'CO2 Ref, CO2 gas'.

<How to check CO_2 zero point voltage>
Refer to 'CO2 Ref' in the screen you can check CO_2 reference cell voltage which is currently memorized.
Refer to 'CO2 Gas' in the screen you can check CO_2 gas cell voltage which is currently memorized.
Note 1) CO_2 sensor cannot be zero calibrated except when CO_2 setting density is 0.0%.
Note 2) 'CO2 Span' is not displayed when CO_2 setting density is 0.0%.

<How to calibrate CO_2 density>
CO_2 span calibration:
1. Input measured CO_2 density into the display '0.0%' besides 'CO2 Span' in the screen.
2. Select 'OK' in MENU screen and press ENTER key to start calibration for chamber CO_2 automatically to match actual CO_2 density with displayed CO_2 density.

Note 1) Repeat calibration several times until actual CO_2 density matches the displayed CO_2 density.
Note 2) Input range for calibration is displayed value +/-1.0%.
Note 3) CO_2 span calibration cannot be done except in CO_2 setting density is 5.0%.

<How to change current conductive ratio of humidifying heater> (Default:5, Setting range:0~19)
Purpose: Control of chamber humidity
Operation: In Select Tools Svc screen, select 'Heater Balance' and 'OK' in MENU screen.
Press ENTER key to step to Heater Balance screen.
Change the digit besides 'Hum Heater'.
If you want to increase chamber humidity, input larger numerical value. To decrease chamber humidity, input smaller numerical value.
Select 'OK' in MENU screen and press ENTER key to memorize the value.
Humidity recovery time:
When chamber temperature is setting temperature – 0.4~-0.6°C, pan heater is forcibly turned on for 10 minutes (maximum) to shorten recovery time for chamber humidity.
Heater is ordinary controlled with the current conductive ratio which is set by 'Heater Balance'.
When the power is supplied, heater is not operated continuously until chamber temperature is set temperature – 0.2°C.
Heater is not operated continuously until chamber temperature is set temperature -0.2℃ after 60 seconds have elapsed since a door opening.

<How to change current conductive ratio of door heater> (Default: 5, Setting range: 0~9)
Purpose: Prevention for condensation on outer door
Operation: In Select Tools Svc screen, select 'Door Balance' and 'OK' in MENU screen.
Press ENTER key to stop to Heater Balance screen.
Change the digit besides 'Door Heater'.
Select 'OK' in MENU screen and press ENTER key to memorize the value.

<Status function>
Purpose: Check for operation status
Operation: Input Service code and select 'OK' in MENU screen. Press ENTER key to display 'Select Tools Svc' screen. Select 'Status' and 'OK' in MENU screen to display 'Hardware'.
You can check setting temperature, setting CO_2 density, CO_2 sensor box setting temperature, ambient temperature, current chamber temperature, current CO_2 setting density and current CO_2 sensor box setting temperature.
Note) It is approx. 7°C higher than actual ambient temperature because AT sensor is located on the PCB which is mounted on rear cover which is affected by heat from electronic components.

Sensor BOX:
1. CO_2 valve is OFF when sensor BOX temperature is deviate from setting temperature (45°C or 50°C) +/- 2.0°C. When sensor BOX temperature is within setting temperature (45°C or 50°C), CO_2 valve is ON to start injection after sensor BOX temperature is stable.

2. When sensor BOX temperature deviates from setting temperature +/- 2.0°C or when it is within 60 minutes since the unit has been turned on, CO_2 is not injected.
3. It takes approx. 30 minutes to start CO_2 injection because sensor BOX temperature is changed temporarily when you turn the power off and on.

12. Data initialization

<How to initialize non-volatile memory>

1. In Select Tools Svc screen, select 'Analog Calibration etc' and 'OK' in MENU screen. Press ENTER key to display 'Analog Calibration etc'.
2. Input '925' into the column besides 'Function'. Select 'OK' in MENU screen and press ENTER key.
3. In Select Tools Svc screen, select 'Initialize data' and 'OK' in MENU screen.
4. Press ENTER key to display message 'Are you sure to delete?'.
5. If yes, select 'OK' in MENU screen and press ENTER key.
6. Remaining time 'Remain' and 'Waiting default value' are displayed and automatically reverts to Top screen.

Note) When you select 'Cancel', display automatically reverts to Select Tools Svc screen.

Default parameter after non-volatile memory initialization

Item	Default	Note
Chamber temp.	37.0℃	
Chamber CO_2 density	0.0%	
UV lamp lighting time	0 minutes	
Temp. zero calibration adjustment value	0.5℃	
Log interval	6 minutes	
CO_2 zero calibration coefficient	500	
CO_2 span calibration coefficient	700	
CO_2 sensor reference output voltage	4000 mV	
CO_2 sensor measure output voltage	4000 mV	
LCD back light	0	0: Blue 1:White
DAQ mode	0	0: Local 1:Remote
UV 24 hours mode	0	0: OFF 1: ON
Remote alarm	1	0: Linked with buzzer 1: Not linked with buzzer
Key lock	0	0: Unlocked 1: Locked
DAQ communication speed	0	0: 2400bps 1: 9600bps 2: 19200bps
DAQ communication ID	0	
High/low temp. alarm	+/- 1.0℃	
High/low CO_2 density alarm	+/- 1.0%	
Alarm delay time	15 minutes	
Ring back	30 minutes	
Door alarm	2 minutes	
Bottom heater balance value	7	
Door heater balance value	5	
Key lock password	0000	
H_2O_2 primary development time	5 minutes	
H_2O_2 primary dissolution time	0 minutes	Natural dissolution
H_2O_2 secondary development time	0 minutes	
H_2O_2 secondary dissolution time	90 minutes	UV dissolution
Decon temperature	45.0℃	
Demo mode	0	0: OFF 1: ON
Optional setting for CO_2 auto changer	0	0: OFF 1: ON
Optional setting for standard gas calibration	0	0: OFF 1: ON
Decon mode	0	0: OFF 1: ON
UV lamp optional setting	0	0: OFF 1: ON
PCB test mode	0	0: OFF 1: ON
CO_2 valve control (Auto changer mode activates)	0	0: Controlled by valve A 1: Controlled by valve A/B
UV lamp lifetime	0 minutes	
CO_2 density for standard gas calibration	5.0%	

13. Serial communication (DAQ)

Setting of serial communication ID

<Operation> In Select Tools(1/2) screen, select 'LCD/DAQ Setting' and input serial ID number in the display '0' besides DAQ ID.
Press ENTER key to set serial communication ID.
Setting range is '000~255'. (000: Not communicated)

Data which can be communicated from unit to PC

- Chamber temperature (TEMP.PV)
- Chamber CO_2 density (CO2.PV)
- UV lamp lighting time (TM.REMUV)
- CO_2 sensor BOX temperature (CO2S.PV)
- Ambient temperature (AT. PV)
- Door ajar
- Water level in humidifying pan
- UV lamp accumulation time (UV. LIFE)

Data which can be communicated from PC to unit

- Chamber set temperature (TEMP. SV)
- Chamber set CO_2 density (CO2. SV)
- UV lamp set lighting time

Setting of serial communication mode

<Operation> In Select Tools(1/2) screen, select 'LCD/DAQ Setting' and change the display '0' besides DAQ mode to your desired digit.
Baud rate is set when you change the digit in DAQ Speed.

Control mode (3rd digit)	0: Local (Default)
	1: Remote
Baud rate (2nd digit)	0: 2400bps
	1:4800bps
	2: 9600bps

14. Remote alarm

Linkage between remote alarm and buzzer

<Operation> In MENU screen, select Set/OK(ENT) and LCD/DAQ Setting.
Change to your desired value 0 or 1 in Remote Alarm.
0: Link with buzzer
1: No link with buzzer

When remote alarm is not linked with buzzer, remote alarm activates (ON) after remote alarm output delay time elapses in alarming condition. Status of remote alarm is not changed (remote alarm still activates) even if buzzer stops sounding by pressing BUZZER key.

When remote alarm is linked with buzzer, remote alarm activates (ON) after remote alarm output delay time elapses in alarming condition. Status of remote alarm is changed (remote alarm turns off) when buzzer stops sounding by pressing BUZZER key.

Remote alarm contact

Normal:	Open between COM and N.O.
In alarm:	Closed between COM and N.O.
In power failure:	Closed between COM and N.O.

Alarm resume time

Ring back setting range:	0~99 minutes (Default: 0 = No ring back)
Operation:	In MENU screen, select Set/OK(ENT) and Alarm Setting.
	Change to your desirable value for Ring Back.

ROM version

Operation: In MENU screen, select Tools/OK (ENT) and Svc/OK (ENT) to display ROM version for both Main board and LCD board.

15. Alarm resume time

When unit goes into alarm condition, buzzer and remote alarm operation will resume even if the BUZZER key is pressed to stop the buzzer from sounding. The remote alarm will continue to operate while in an alarm condition.

Function:

1. Buzzer sounds again after alarm resume time expires if someone presses BUZZER key to stop buzzer from sounding.
2. Action of remote alarm is not cancelled by pressing BUZZER key.
3. Alarm indication on the control panel will continue to indicate alarm condition.

<Alarm operation>

Status	Alarm resume time is 30min. (Ring Back = 030)	Alarm does not resume (Ring Back = 000)
Alarm	● Buzzer stops sounding with BUZZER key pressed ● Remote alarm and alarm indication remain active	
Alarm → Normal condition	● Alarm stand-by ● When unit goes into alarm condition again, buzzer and remote alarm activate and alarm indication will be shown.	
Alarm remain active after alarm resume time has passed	Buzzer sounds again after 30 min has passed since BUZZER key was pressed.	When BUZZER key is pressed, buzzer does not sound unless unit is still in alarm condition. Remote alarm and alarm indication remain active.

<Special mode for remote alarm and buzzer>

Remote alarm action can be interlocked with buzzer in F24.

Note: Do not open the value for F24, to prevent remote alarm action being changed.

		Remote alarm contact operation	
		Not linked with buzzer (Default) (Remote alarm = 1)	Linked with buzzer (Remote alarm = 0)
Buzzer resume	Automatic (Default) (Ring Back=030)	Buzzer resumes automatically Remote alarm remains active	Both buzzer and remote alarm resume automatically
	Not automatic (Ring Back=00)	Buzzer does not resume Remote alarm remains active	Both buzzer and remote alarm do not resume

Setting value	Remote alarm operation
Remote Alarm = 1 (Default)	Not linked with buzzer
Remote Alarm = 0	Linked with buzzer

16. Data comparison

Data in non-volatile memory is called for twice to compare the data which was called first with the data which was called second when the power is supplied.

If the data which was called first is matched with the data which was called second, the data will be stored in RAM. If not, this comparison will be repeated until the data matches.

17. Temperature display offset value

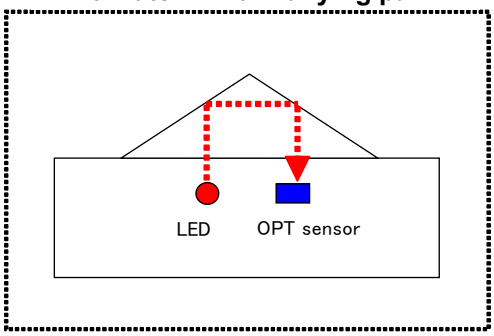
The difference between temperature of temp. control sensor and center chamber temperature is offset:

Offset value: +1.2°C

Displayed value = Temperature of Temp. control sensor +1.2°C

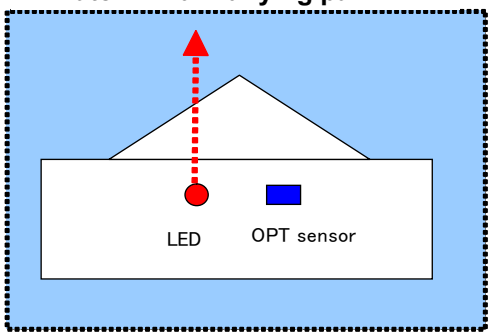
18. Water sensor operation

< No water in humidifying pan >



CN15
#1-#2: DC5V(INPUT)
#2-#3: ≒0V

< Water in humidifying pan >



CN15
#1-#2: DC5V(INPUT)
#2-#3: ≒DC4V(OUTPUT)

* You can check the above voltage for 3 seconds just after the door closed. (door switch pressed)

19. Automatically MENU screen OFF

When MENU is displayed in Top screen, it is gone off if there is no key operation for 1 minute.
When MENU is not displayed in Top screen, display is renewal once a hour if there is no key operation.

20. UV lamp extensional ON period

UV lamp stays illuminated for an extended period depending on its age.

UV lamp life time	UV lamp extensional ON period
0 ~ 200H	0% (Not extended)
200 ~ 400H	20%
400 ~ 600H	40%
600 ~ 800H	60%
800 ~ 1000H	80%
1000H ~	100%

UV lamp ON period
= (UV lamp setting ON period) + (UV lamp setting ON period x UV lamp extensional ON period)

(Ex.) UV lamp setting ON period: 5 minutes and UV lamp life time is 900H
5 minutes + (5 minutes x 80%) = 9 minutes

21. Other functions

<Operation> In MENU screen, select MENU/Tools – Svc and 'Analog Calibration etc'.

Function #	Function
0	Default mode
019	Initialization of CO_2 zero adjustment (500) Initialization of CO_2 span adjustment (700)
101	Display of Key lock password
925	Initialization of non-volatile memory After '925' is set and select MENU/Tools – Svc – Delete All User data. Turn the power off and on to initialize data in non-volatile memory. Function # is returned to '0' automatically. (Note) Temperature calibration value is also initialized.

Operational specifications of LCD panel

< For service >

<Contents>

1. Standard gas calibration

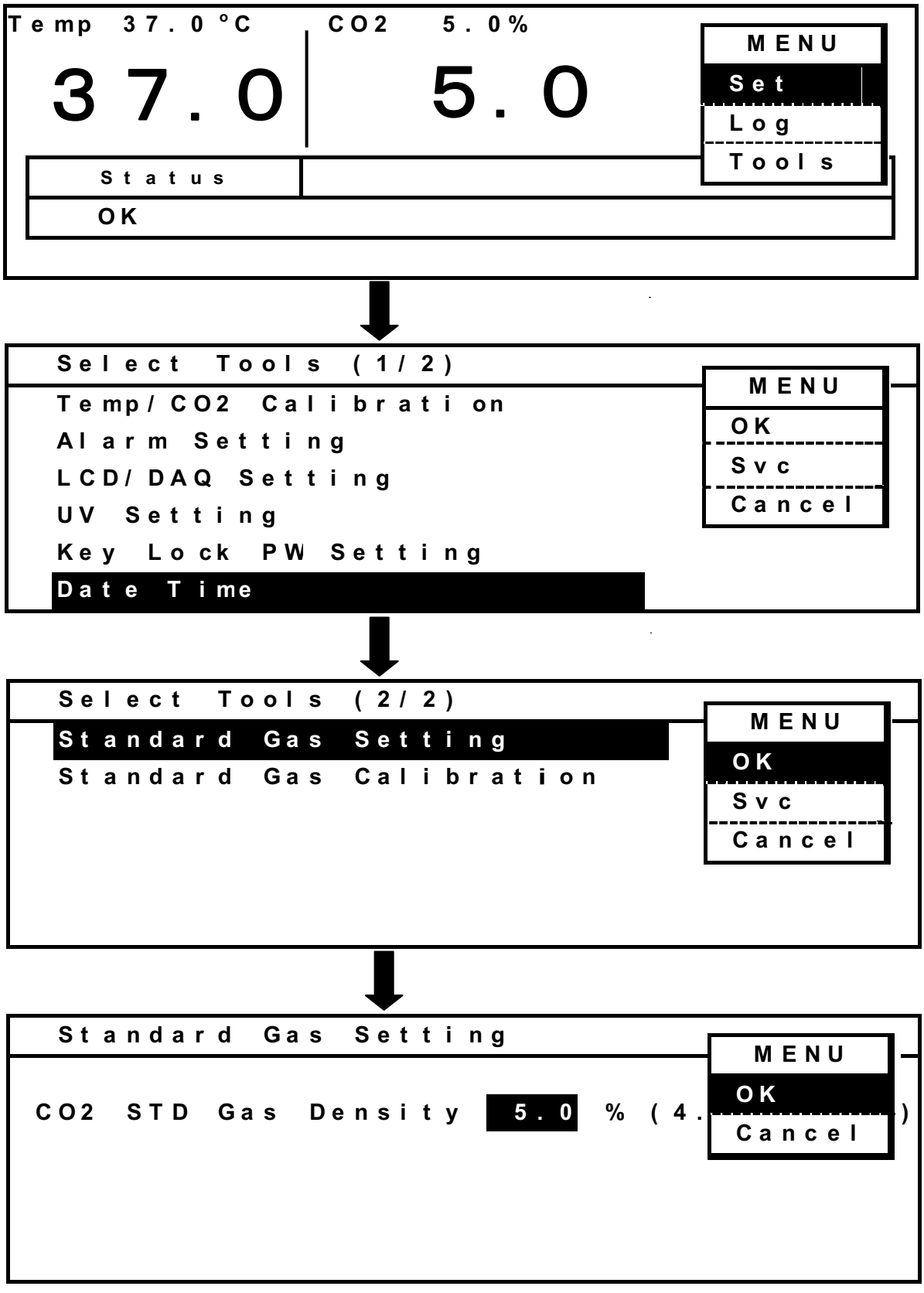
2. CO_2 sensor zero calibration

3. H_2O_2 decontamination

4. MENU/Tools – Select Tools Svc（Service function）

(1) Service code input
(2) Option Settings
(3) UV lamp Reset Timer
(4) Adjustment for heater balance
(5) Setting of H_2O_2 decontamination time
(6) Status（Display of sensor status）
(7) Initialization of non-volatile memory

1. Standard gas calibration



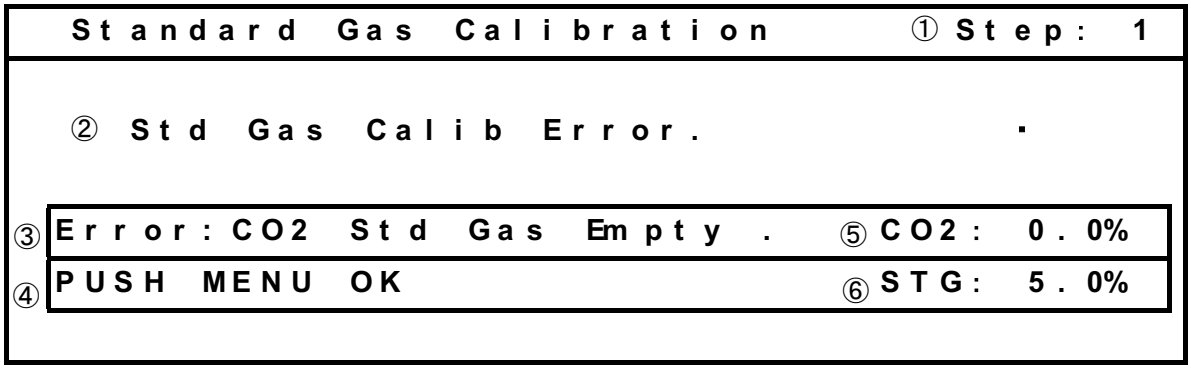
<Standard gas calibration>

・Input CO_2 density when you calibrate using standard gas (optional setting). Default setting is 5.0%.

（Note）Input range is 4.0～21.0%. CO_2 setting is 4.0% when you input digits that are 4.0 or lower and 21.0% when you input digits that are 21.0 or higher.

Procedure to set standard gas CO_2 density　(Ex. 5.0% for standard gas density)

	Operation	MENU
0	In Top Screen, press MENU key to display MENU screen. Select Tools and press ENTER key.	Tools
1	Select Standard Gas Setting in Select Tools（2/2） screen.	
2	Press MENU key to activate MENU screen. Select OK and press ENTER key.	OK
3	Change the digits to 5.0 in the column CO2 STD Gas Density in Standard Gas Setting.	
4	Press MENU key to display MENU screen. Select OK and press ENTER key.	OK
5	Standard gas CO_2 density is set to 5.0%.	



<Standard gas calibration mode>

① Display of step in standard gas mode
Step currently activates is shown.

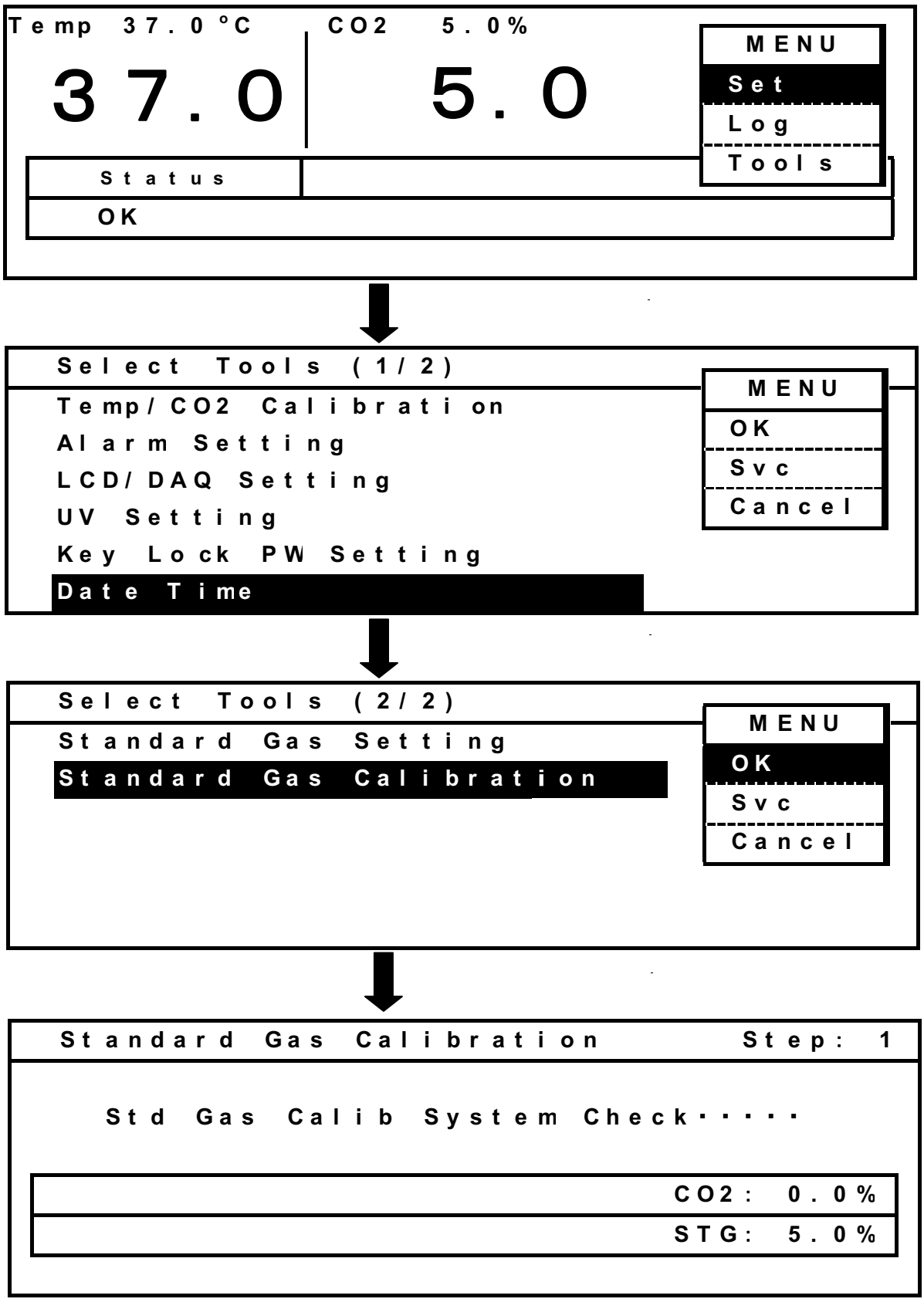
② Display of unit operation status
Operation status during standard gas calibration is shown.

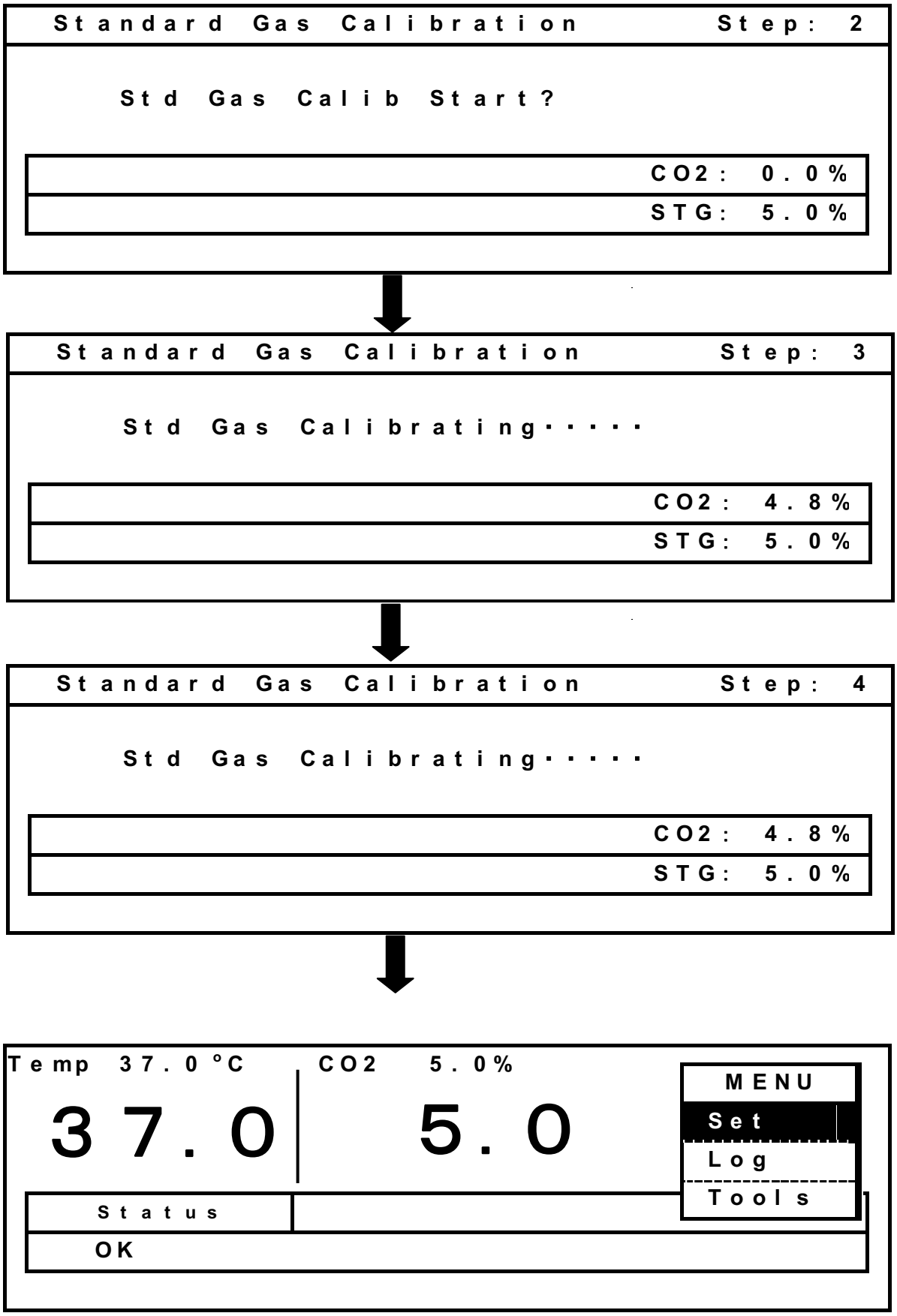
③ Error message
Error message is shown when any error occurs during standard gas calibration mode.

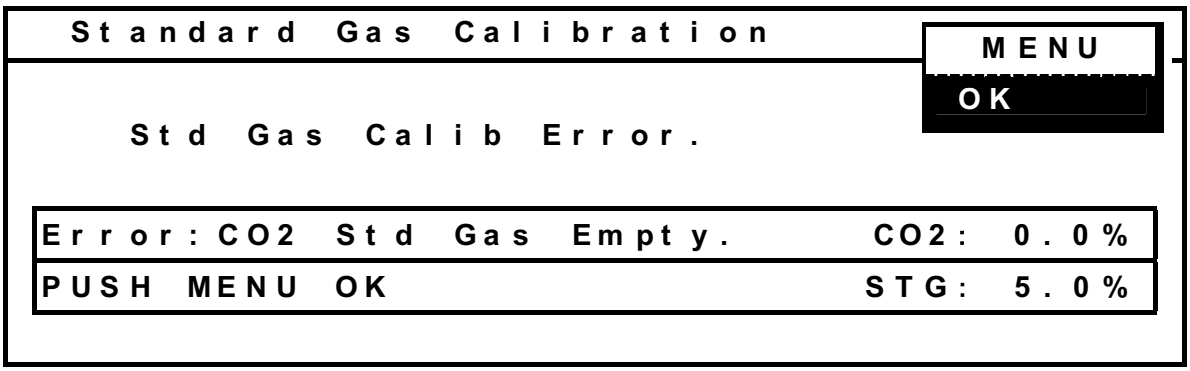
④ Direction to operator
When standard gas calibration mode is complete, direction to operator, such as 'PUSH MENU OK' is given.

⑤ Display of CO_2 sensor density during standard gas calibration
CO_2 density sensed by the CO_2 sensor during standard gas calibration is shown.

⑥ Display of CO_2 standard gas density


Temp 37.0 °C
CO2 5.0%
37.0
5.0
MENU
Set
Log
Tools
Status
OK
Select Tools (1/2)
Temp/CO2 Calibration
Alarm Setting
LCD/DAQ Setting
UV Setting
Key Lock PW Setting
Date Time
MENU
OK
Svc
Cancel
Select Tools (2/2)
Standard Gas Setting
Standard Gas Calibration
MENU
OK
Svc
Cancel
Standard Gas Calibration Step: 1
Std Gas Calib System Check·····
CO2: 0.0%
STG: 5.0%


Standard Gas Calibration Step: 2
Std Gas Calib Start?
CO2: 0.0%
STG: 5.0%
Standard Gas Calibration Step: 3
Std Gas Calibrating·····
CO2: 4.8%
STG: 5.0%
Standard Gas Calibration Step: 4
Std Gas Calibrating·····
CO2: 4.8%
STG: 5.0%
Temp 37.0°C
CO2 5.0%
37.0
5.0
MENU
Set
Log
Tools
Status
OK



<Standard gas calibration> * Only available if Automatic CO_2 density option is installed.

（Note）In System Configuration screen, set Std Gas Calibration in 1 to step into Standard Gas Calibration.
The display automatically reverts to Top Screen if you don't set.

Step	0	1	2	3	4	5
Status	Normal operation	Pressure check for std.gas tank	Start key stand-by	Std.gas inject	CO_2 calibration	CO_2 calibration finished
Std.gas control valve	OFF	→→→	→→→	ON	→→→	OFF
Display		Std Gas Calib System Check…	Std Gas Calib Start?	Std Gas Calibrating･･･	Std Gas Calibrating･･･	Std Gas Calib Finished.
Note		Error message(※) displays when std.gas tank is empty				Error message(※) displays when std.gas tank becomes empty

※Error message 'Error:CO2 Std Gas Empty' displays when standard gas tank becomes empty.

<Error message>

・Only one error messages is displayed even if several errors occur simultaneously.

Error #	Status	Display	Operation
Error 41	Cylinder for standard gas calibration becomes empty. (Message is triggered by CO_2 pressure at pressure switch)	CO2 Std Gas Empty.	Invalid for automatic calibration

Procedure to calibrate standard gas density automatically (Ex. 5.0% for standard gas density)

	Operation	MENU
0	In Top Screen, press MENU key to display MENU screen. Select Tools and press ENTER key.	Tools
1	Select Standard Gas Setting in Select Tools（2/2） screen.	
2	Press MENU key to activate MENU screen. Select OK and press ENTER key.	OK
3	System check for standard gas is done automatically.	
4	● Start of standard gas calibration Select OK in MENU screen and press ENTER key.	OK
	● Cancel standard gas calibration Select Cancel in MENU screen and press ENTER key to revert to Select Tools (1/2) screen.	Cancel
	● When error message-standard gas tank is empty-displays Select OK in MENU screen and press ENTER key. Check standard gas tank.	OK
5	Calibration will start automatically with injecting standard gas into CO_2 sensor.	
6	● When calibration completes correctly The display automatically reverts to Top Screen.	OK
	● When Standard gas depletes during calibration Press MENU key to display MENU screen. Select OK and press ENTER key to check standard gas tank.	OK
7	● Standard gas auto calibration is complete.	OK

2. CO_2 sensor zero calibration

Temp/ CO2 Calibration						
			PV	Volt		
Temp	Span	0.0°C	37.0°C			0.0°C
CO2	Zero	0.1 %	0.0%	4.02	V	500
CO2	Span			4.01	V	500
CO2	Ref			4.02	V	
CO2	Gas			4.01	V	

<CO2 sensor zero calibration>

1. Turn the power on and allow the unit until chamber temperature to stabilize (Approximately 2 hours). Once stable, The CO_2 sensor BOX temperature should read 45±2℃ and CO_2 setting value should be 0.0%.
2. Select Temp/CO2 Calibration in Select Tools screen and set CO_2 sensor reference cell voltage (CO2 Zero) to 4.00V±0.03V. Another way is to measure voltage at both leads of R63 on the Main PCB. (Turn the potentiometer VR3 near CN15 to achieve desired voltage)
3. Select Temp/CO2 Calibration in Select Tools screen and set CO_2 sensor gas cell voltage (CO2 Sapn) to 4.00V±0.03V. Another way is to measure voltage at both leads of R40 on the Main PCB. (Turn the potentiometer VR2 near CN3 to achieve desired voltage)
4. Input '0.0' to '0.1%' in the highlighted area to the right of 'CO2 Zero'. Press MENU key to display MENU and select OK then press ENTER key to start CO_2 sensor zero calibration. CO_2 sensor reference cell voltage and CO_2 sensor gas cell voltage are stored.

<Check for CO_2 sensor reference cell voltage and CO_2 sensor gas cell voltage>

In the column,'CO2 Ref', you can check CO_2 sensor reference cell voltage currently stored.

In the column 'CO2 Gas', you can also check CO_2 sensor gas cell voltage currently stored.

(Note) CO_2 sensor zero point calibration cannot be done except when CO_2 density is set in 0.0%.

(Note) The column 'CO2 Span' is blank when CO_2 density is set to 0.0%.

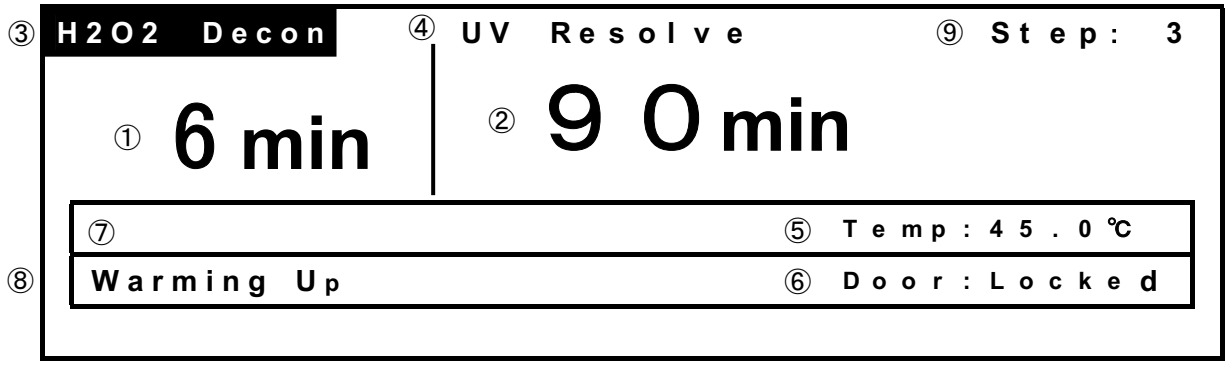
3. H_2O_2 decontamination

<H_2O_2 decontamination>

・H_2O_2 generator (MCO-HP) and H_2O_2 decontamination kit (MCO-HL) are optional accessories. This procedure applies only if the options are installed.
They are standard equipped in MCO-19AIC(UVH).

System Configuration		
UV Function	1	(0. OFF 1. ON)
Decon Function	1	(0. OFF 1. ON)
Std Gas Cal Function	0	(0. OFF 1. ON)
CO2 Gas Auto Changer	0	(0. OFF 1. ON)
Demo Mode	0	(0. OFF 1. ON)

（Setting of H2O2 Decon）
Select System Configuration in Select Tools Svc and set '1. ON' for both'UV Function' and 'Decon Function'.
（H_2O_2 decontamination mode does not activate without setting in '1. ON' even if H2O2 key is pressed for 5seconds.）



（Display of H_2O_2 Decon mode）

① H_2O_2 misting time
Remaining mist time in H_2O_2 decontamination mode is displayed.

②H_2O_2 resolution time
Remaining H_2O_2 resolution time in H_2O_2 decontamination mode is displayed. Resolution by UV lamp is performed.

③Notice of H_2O_2 spray
H_2O_2 is spraying when 'H_2O_2 Decon' blinks.
High H_2O_2 density in the chamber when 'Decon' blinks.（H_2O_2 is not sprayed.）

④Status of H_2O_2 misting
H_2O_2 UV is resolved when 'UV Resolve' blinks.

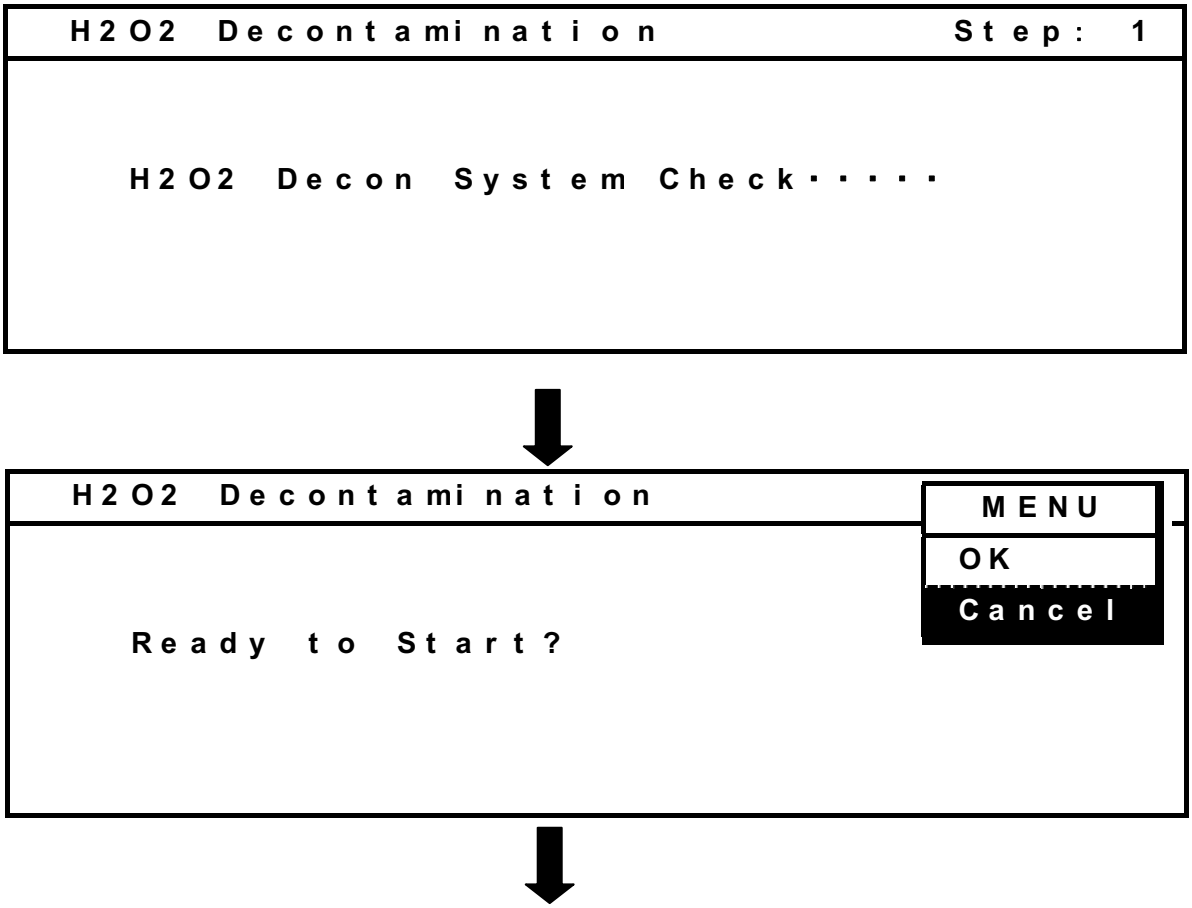
⑤Chamber temperature display
Chamber temperature during H_2O_2 decontamination mode is displayed.

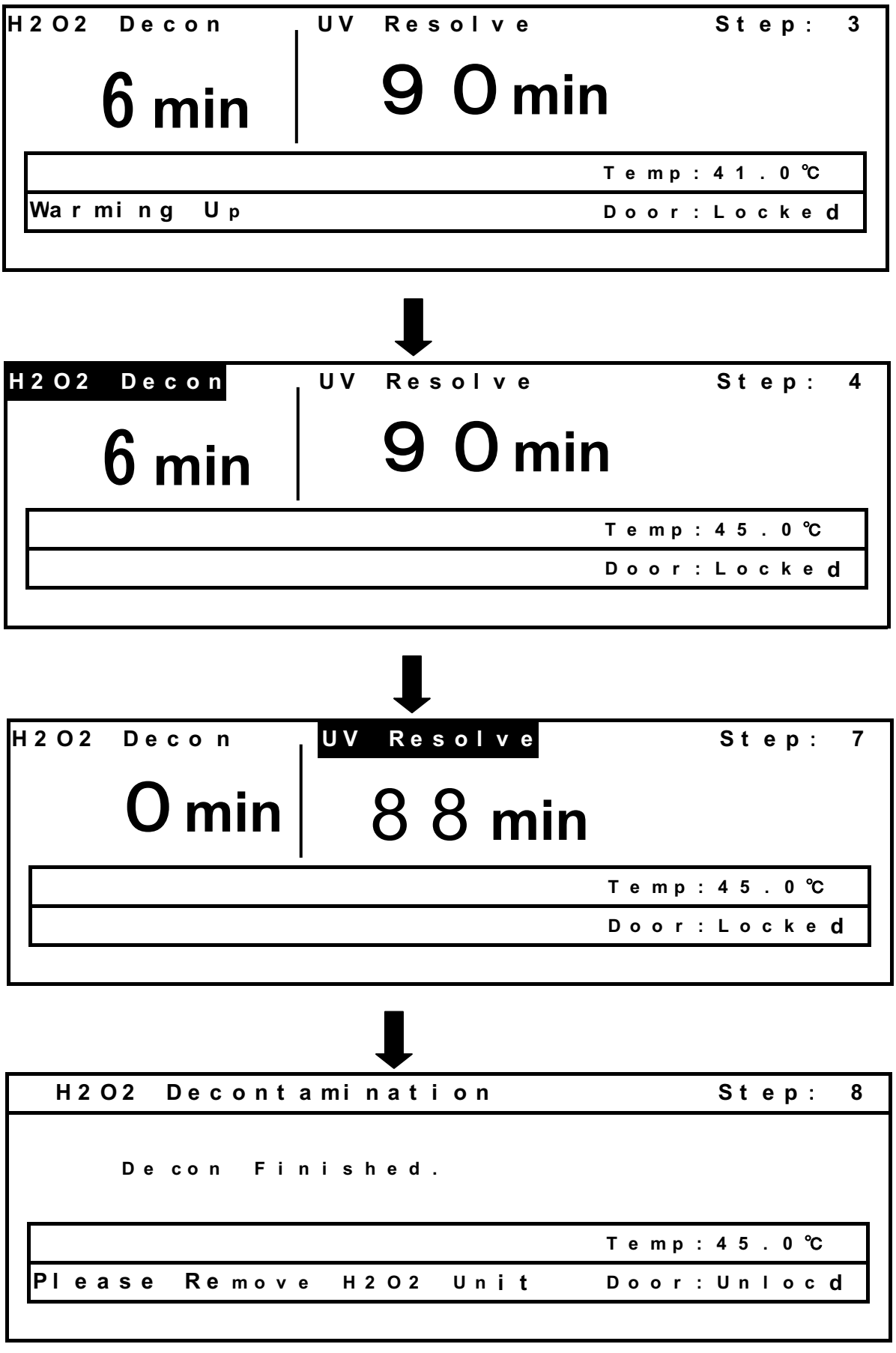
⑥Door status display
Door open/close during H_2O_2 decontamination mode is displayed.

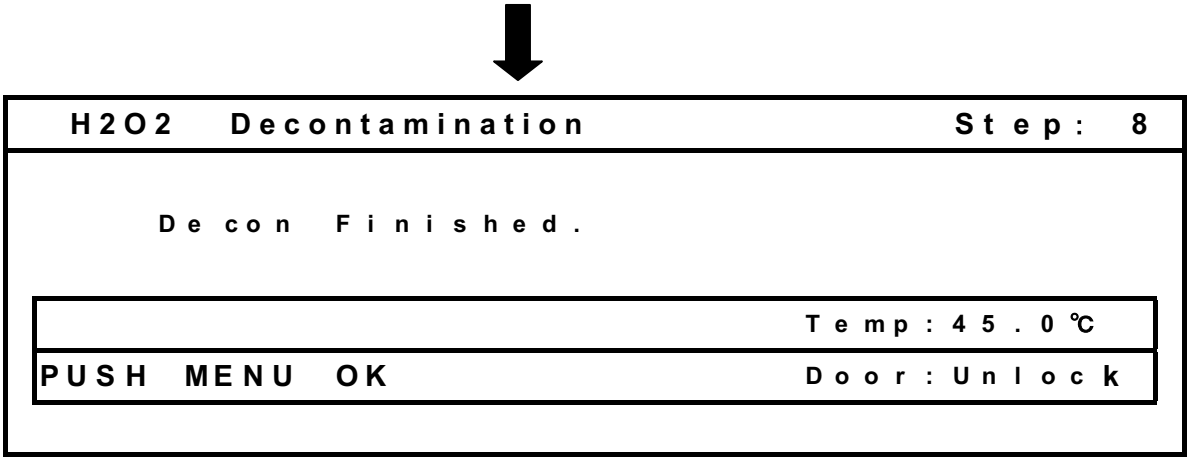
⑦Error message
Error message displays if an error occurs in H_2O_2 decontamination mode.

⑧Direction to operator
Direction to operator is displayed.
Ex）' Please Remove H2O2 Unit '

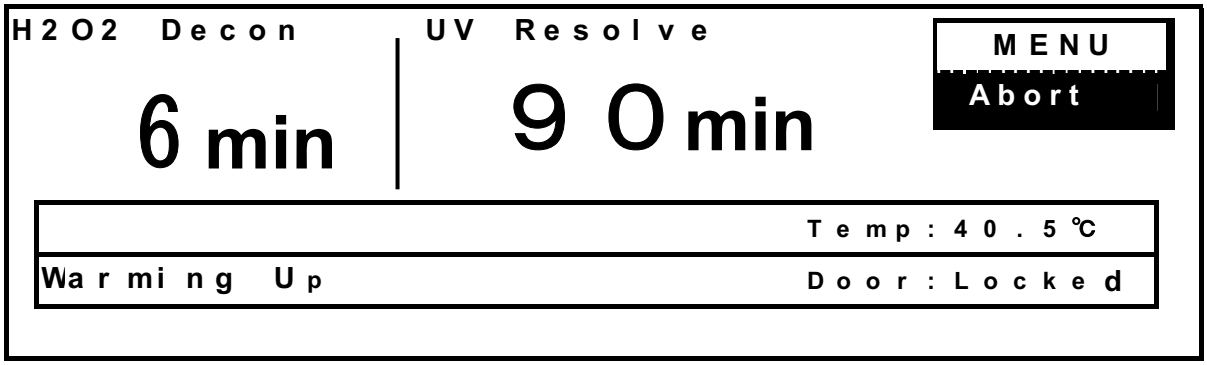
⑨Current step in H_2O_2 decontamination mode is displayed.

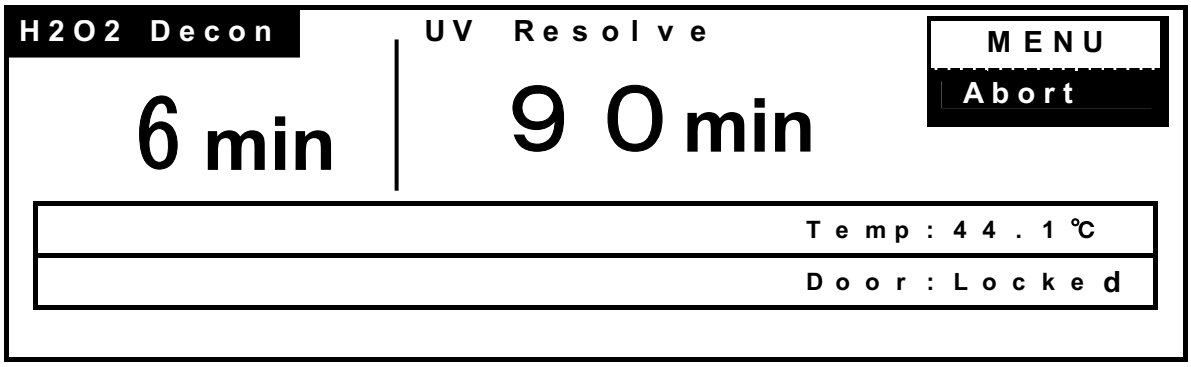

H2O2 Decontamination
Step: 1
H2O2 Decon System Check·····
H2O2 Decontamination
MENU
OK
Cancel
Ready to Start?

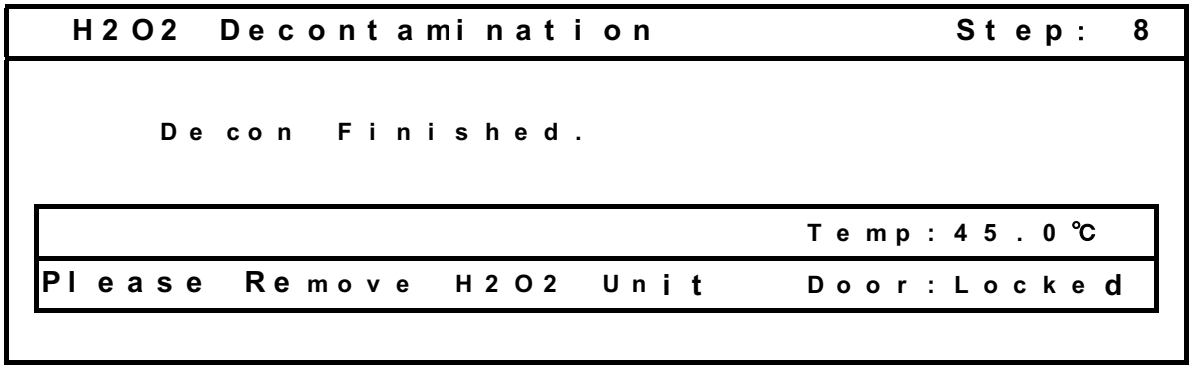

H2O2 Decon
UV Resolve
Step: 3
6 min
90 min
Temp:41.0℃
Warming Up
Door:Locked
H2O2 Decon
UV Resolve
Step: 4
6 min
90 min
Temp:45.0℃
Door:Locked
H2O2 Decon
UV Resolve
Step: 7
0 min
88 min
Temp:45.0℃
Door:Locked
H2O2 Decontamination
Step: 8
Decon Finished.
Temp:45.0℃
Please Remove H2O2 Unit
Door:Unlocd



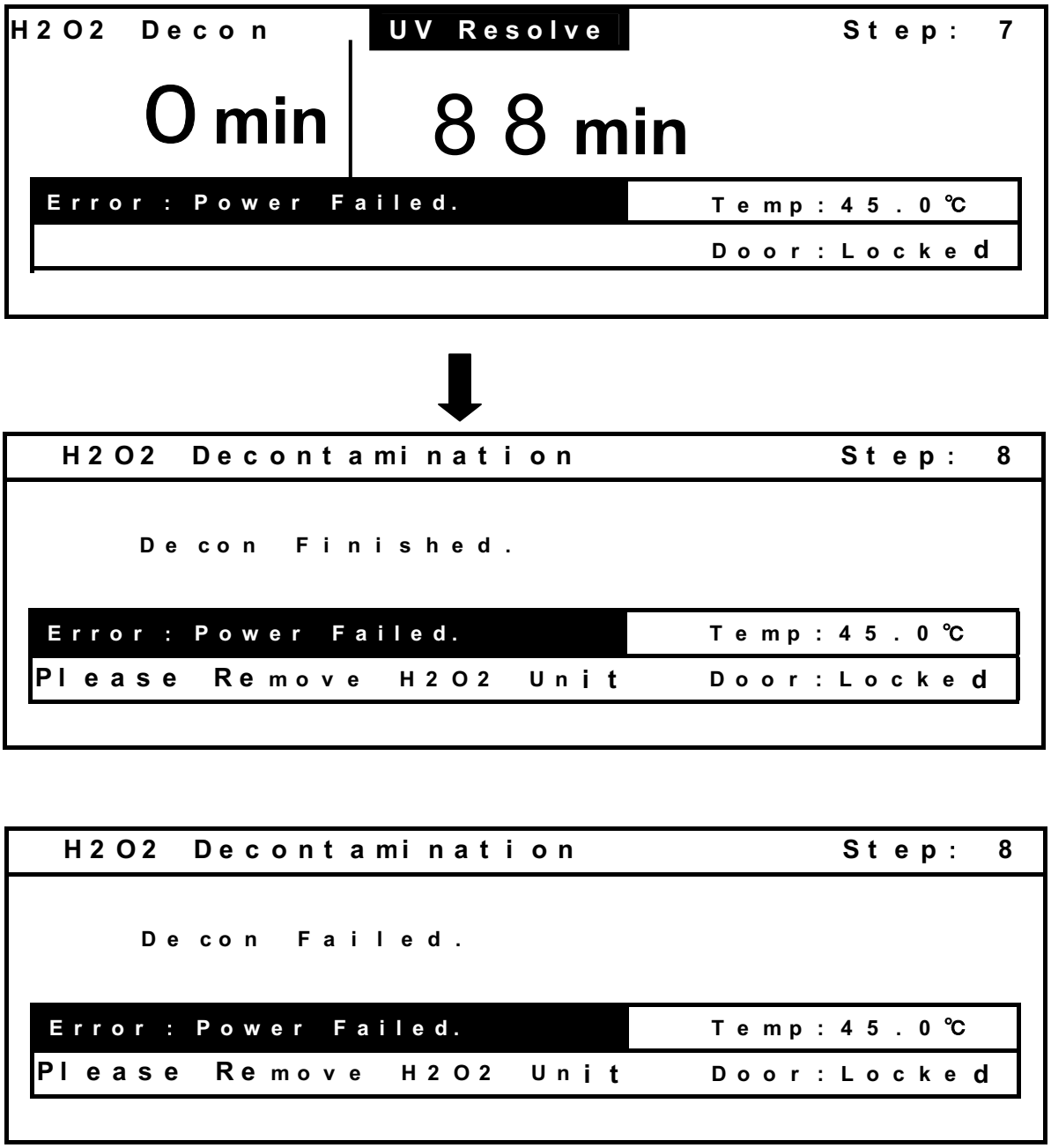
<H_2O_2 decontamination mode>
Press H2O2 key for 5 seconds to start H_2O_2 decontamination.
Select System Configuration in Select Tools Svc and set ‘1. ON’ for both‘UV Function’ and ‘Decon Function’







<Forced completion of H_2O_2 decontamination mode>
While the chamber temperature is warming to optimum conditions for decontamination (Step:3) and during H_2O_2 misting (Step:4), H_2O_2 decontamination mode can be terminated.
While chamber temperature is warming, press MENU key to display MENU. 'Abort' activates by pressing ENTER key to display 'Decon Abort'. This will force the H_2O_2 decontamination press to end.



<Power failure during H_2O_2 decontamination mode>
If the power fails during H_2O_2 misting (Step:4) or UV resolution (Step:7), while in H_2O_2 decontamination mode, UV resolution will reset and repeat. The message, 'Error: Power Failed' will be displayed.
If the power fails during H_2O_2 misting (Step:4), 'Decon Failed' will be displayed.
If the power fails during UV resolution (Step:7), 'Decon Finished.' will be displayed.

<Procedure for H_2O_2 decontamination>

	Operation	MENU
0	Pour specified amount of H_2O_2 reagent (6%) into H_2O_2 generator（MCO-HP, option）. Connect the plug from the H_2O_2 generator to the port at the rear right side chamber. Close the inner and outer doors.	
1	Press H2O2 key for 5seconds.	
2	The message 'DECON START' will be displayed. Select MENU and OK then press ENTER key.	OK
3	H_2O_2 decontamination will commence. H_2O_2 begin misting. （The message 'H2O2 Decon' blinks on the upper left side of screen）	
4	Unit stops H_2O_2 misting and performs UV resolution. （The message 'UV Resolve blinks in the center of screen）	
5	When the message 'Please Remove H2O2 Unit' is displayed on the lower left of the screen, H_2O_2 decontamination mode is complete. Open the inner and outer doors, disconnect H_2O_2 generator plug from the port.	
6	The message 'PUSH MENU' is displayed on the lower left side of the screen. Select MENU and OK then press ENTER key to revert to Top Screen.	OK

<Operation sequence of H_2O_2 decontamination>

Ex）Primary H_2O_2 spray time: 7 minutes　Primary H_2O_2 resolution time: 30 mintues
Secondary H_2O_2 spray time: 5 minutes　Secondary H_2O_2 resolution time: 90 minutes

Step	0	1	2	3	4	5	6	7	8
Status	Fixed operation	H_2O_2 Unit check	Key input stand-by	Temp. warming-up	Primary H_2O_2 spray	H_2O_2 preserved	Secondary H_2O_2 spray	UV resolution	Finish
Ultra-wave oscillator	OFF	→ → →	→ → →	→ → →	ON	OFF	ON	OFF	OFF
UV lamp	OFF	→ → →	→ → →	→ → →	→ → →	→ → →	→ → →	ON	OFF
Chamber temp.	37.0℃	→ → →	→ → →	37.0℃ ↓ 45.0℃	45.0℃	→ → →	→ → →	→ → →	45.0℃
Electric lock	OFF	→ → →	→ → →	ON	→ → →	→ → →	→ → →	→ → →	OFF
Display				Warming-up Temp. display blinks	H_2O_2 Decon blinks	Decon blinks	H2O2 Decon blinks	UV Resolve blinks	

(Note) In default setting, H_2O_2 preservation time is set to 0 minute (Step 5) and Secondary H_2O_2 spray time is set to 0 minute (Step 6). UV resolution (Step 7) is performed skipping Step 5 and 6 after Primary H_2O_2 spray (Step 4) is complete.

<Step and command on LCD display>

(Display sequence: Decon'C'→Decon'S'→Decon'W'→Decon'D'→Decon'E'→Decon'F')

Step	Command on LCD		Key operation	Status
0		Normal mode		Decon Option setting mode
1	C(663)	H_2O_2 unit check mode		H_2O_2 key is pressed for 5seconds 'H2O2 Unit System Check' is displayed
2	S(652)	Stand-by for Decon start		
3	W(662)	Stand-by for temp. warm-up	Ability to Abort	Locked by electric lock Chamber temp. is changed from 37℃ to 45℃
4	D(653)	Decon mode 1	Ability to Stop	Starts H_2O_2 mist(oscillator ON)
5	↓	(H_2O_2 preservation mode)	Inoperative	Stops H_2O_2 mist(oscillator OFF)
6	↓	(Decon mode 2)	Inoperative	Restarts H_2O_2 mist(oscillator ON)
7	↓	UV resolution mode	Inoperative	H_2O_2 mist (oscillator ON) UV lamp is lit
8	E(654)	Finish (Ready to remove H_2O_2 generator)		Electric lock unlocked UV lamp is extinguished Message 'Please Remove H_2O_2 Unit'
	F(655)	Finish (stand-by for Decon mode finish)		Message 'PUSH MENU OK'

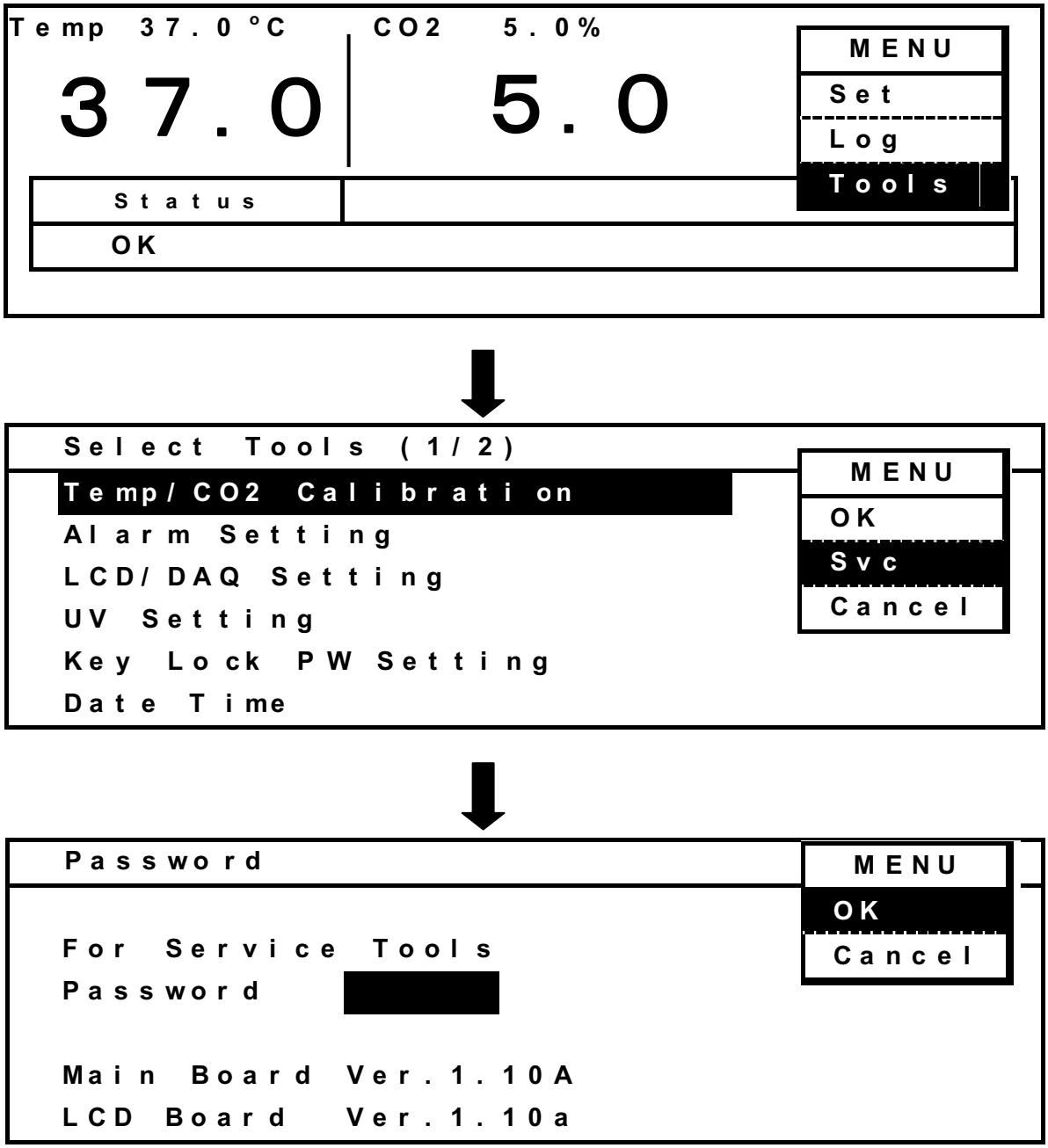
C:Check / S:Start / W:Temp Warming Up / D:Decon / E:End / F:Finish

<Error message during H_2O_2 decontamination>

Error #	Status	Display	Buzzer	Action
Err 31	When H_2O_2 generator is disconnected	'H2O2 Decon System Error' 'Err31:H2O2 Unit No Connect.'		Decontamination mode aborts
Err 32	When H_2O_2 reagent has not been added or H_2O_2 sensor fails or is disconnected	'Err32: H2O2 Level is Low'		Decontamination mode aborts
Err 33	When the door ajar	'Err33: Door is Opening'		Decontamination mode aborts
Err 34	When H_2O_2 is abnormally generated (May be caused by faulty oscillator, faulty fan, poor fan operation or H_2O_2 generator was set incorrectly when H_2O_2 mist time is set to 3minutes or longer)	'Err34: H2O2 Volume'	Sounds	
Err 36	When UV lamp fails	'Err36: UV Lamp Failure'	Sounds	Extended to perform UV resolution
Err 35	When power fails to H_2O_2 generator	'Err35: Power Failed.' is displayed after power returns 'Decon Failed.' Is displayed after UV resolution is finished.	Sounds	UV resolution is performed as soon as power returns.
Err 37	When power is failed in UV resolution process	'Err37: Power Finished.' is displayed after power retrieves. 'Decon Finished' is displayed after UV resolution is finished.		UV resolution is performed again when power retrieves.

(Note) Only one error messages is displayed even if multiple messages are present.

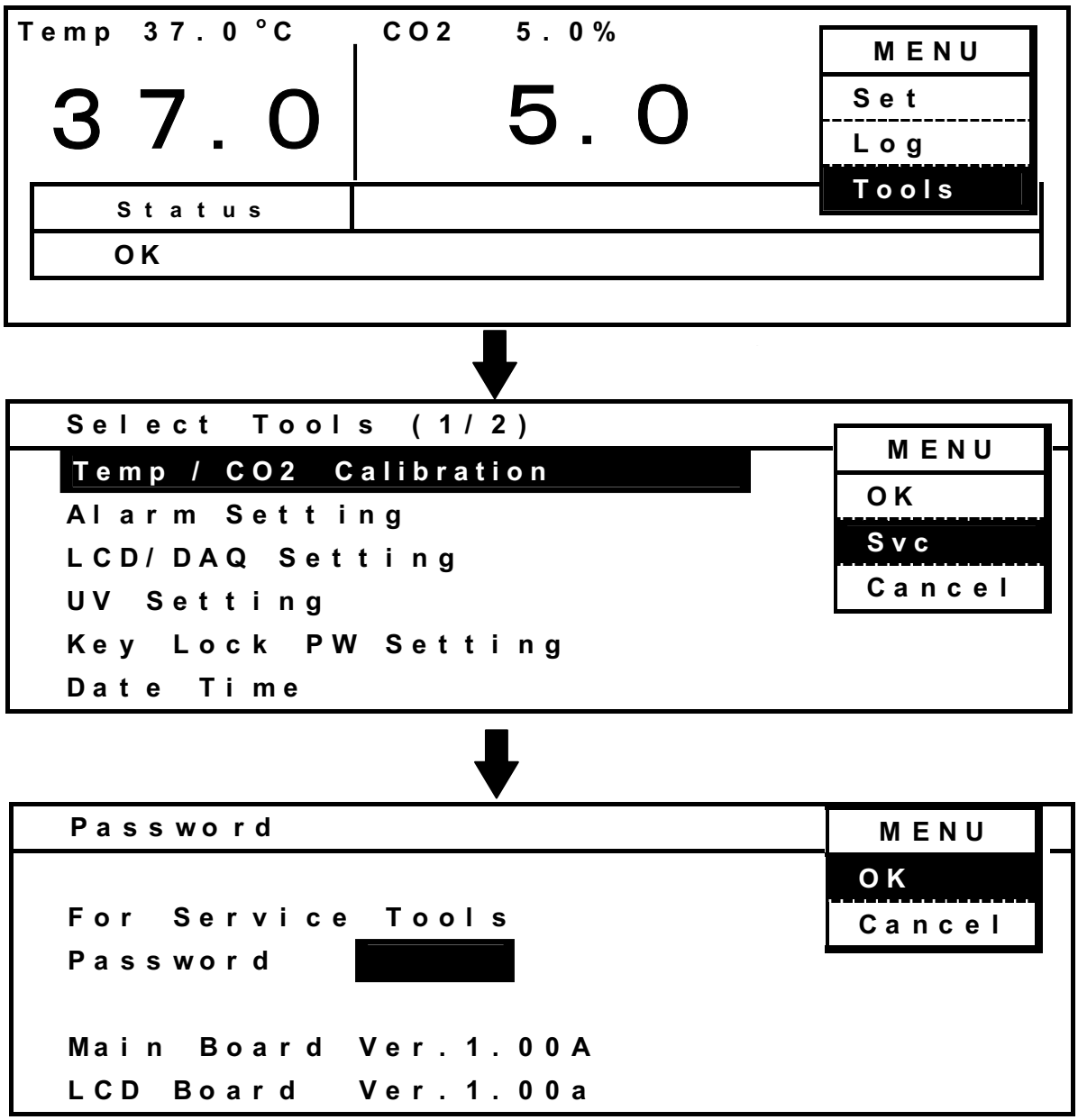
<Check for ROM version>



	Operation	MENU
0	Turn the power on.	
1	Top Screen	Tools
2	Select Tools（1/2） screen	Svc
3	In Password screen, ROM version is displayed in lower message area.	OK

4. MENU/Tools – Select Tools Svc（Service function）

(1) Service code input



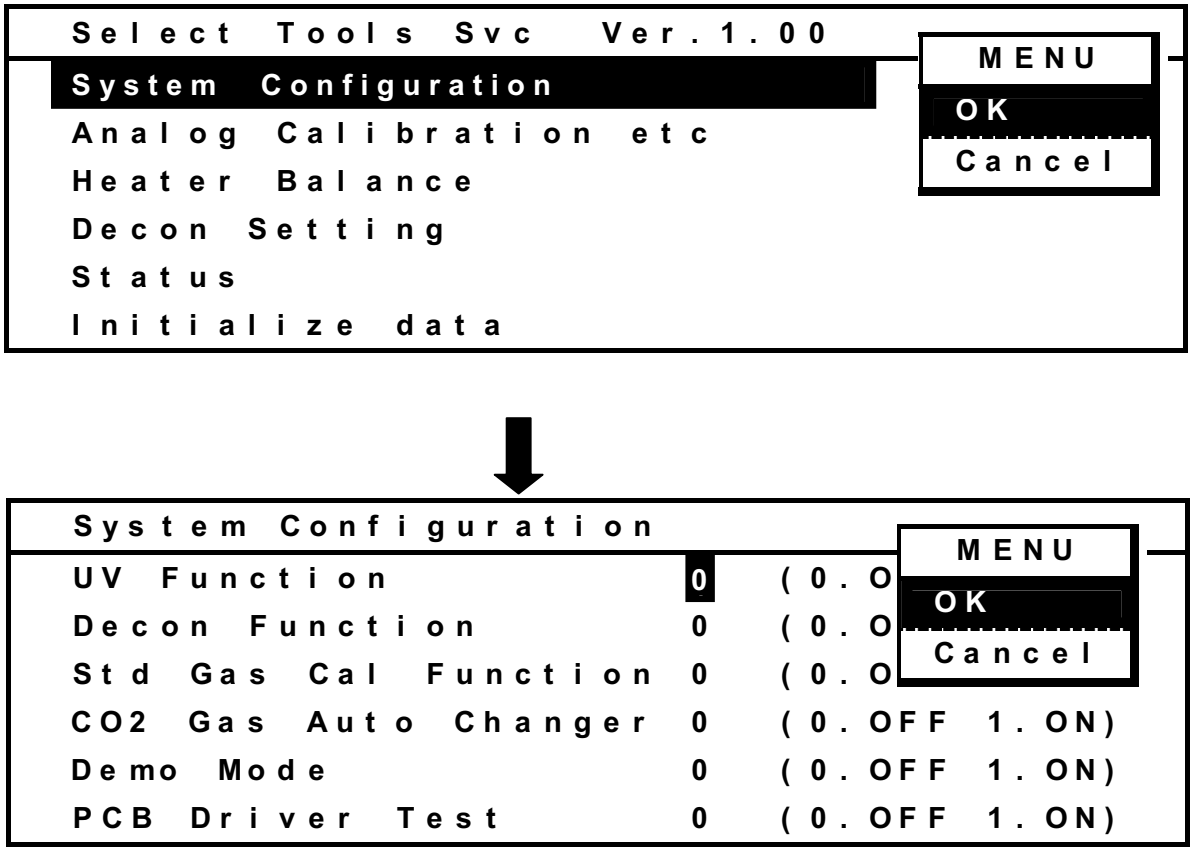
<Service code input>

You can check unit status (service only) if you input service code '384'.

1) In Top Screen, select MENU and Tools, Svc.
2) Press ENTER key to step to 'Password' screen.
3) 'For Service Tools'/'Password ' is displayed.
4) Input 『384』 for service code to check service data.

(Note) If you input wrong service code, the message 'Wrong Password' is displayed under 'Password' and error tone emits. Service code is unchangeable.

(2) Option settings



<Setting of UV lamp function> (Default: 0)

・Set UV lamp mode option prior to use of UV lamp function (standard for MCO-19AIC(UVH)).

1) In Select Tools Svc screen, select 'System Configuration' and MENU.
2) Select OK and press ENTER key.
3) Input '0' to the right side of 'UV Function' if the UV lamp is not installed. Input '1' to the right side of 'UV Function', if the UV lamp is installed.

(Note) You cannot step to 'UV Setting' in Select Tools(1/2) screen without setting UV lamp mode optionally. Display reverts top screen automatically.

<Setting of H_2O_2 decontamination> (Default: 0)

・Set H_2O_2 decontamination mode option prior to use of H_2O_2 generator and H_2O_2 decontamination kit.

1) In Select Tools Svc screen, select 'System Configuration' and MENU.
2) Select OK and press ENTER key.
3) Input '0' to the right side of 'Decon Function', for H_2O_2 decontamination mode inoperative. Input '1' to the right side of 'Decon Function', for H_2O_2 decontamination mode operative if the option is installed.

(Note) You cannot step to H_2O_2 decontamination mode in Top Screen without setting UV lamp mode and H_2O_2 decontamination mode options.

<Setting of standard gas auto calibration> (Default: 0)

- Set Automatic CO_2 density calibration add-on kit (MCO-SG) prior to use.

(1) In Select Tools Svc screen, select 'System Configuration' and MENU.
(2) Select OK and press ENTER key.
(3) Input '0' to the right side of 'Std Gas Cal Function' if Automatic CO_2 density calibration mode is inoperative. Input '1' for Automatic CO_2 density calibration mode if the option is installed.

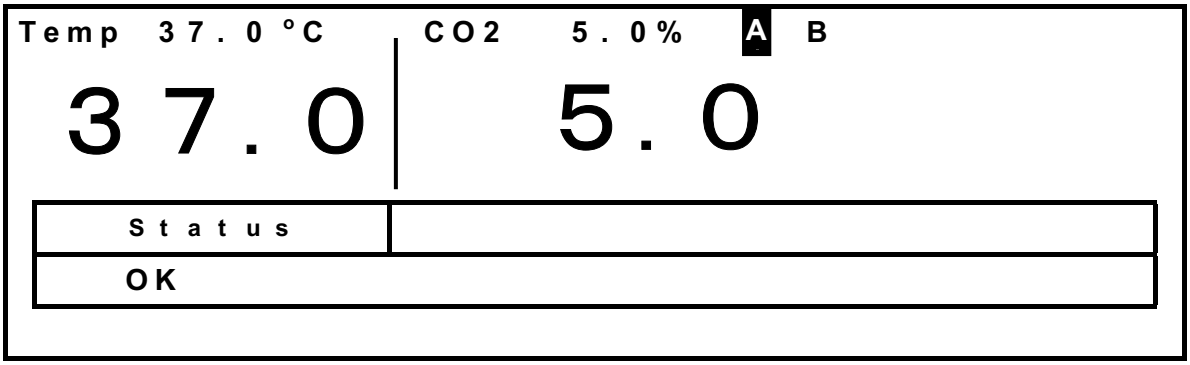
(Note) You cannot step to 'Standard Gas Setting' in Select Tools(2/2) screen without setting Automatic CO_2 density calibration mode option.

<Setting of CO_2 auto change option mode> (Default: 0)

- When you set CO_2 auto changer mode, 2 CO_2 tanks can be connected to 1 unit. If one tank becomes empty, you can use the other tank.

(1) In Select Tools Svc screen, select 'System Configuration' and MENU.
(2) Select OK and press ENTER key.
(3) Input '0' to the right side of 'CO2 Gas Auto Changer', if Auto changer mode is inoperative. Input '1', if Auto changer mode is operative or option is installed. A or B (currently used tank) will be displayed in highlight.
For example: If cylinder A, current using becomes empty, digit A blinks on the display.

<Ex. Tank A is currently connected>



<Demo mode>

- The unit does not operate normally in this mode.

(1) In Select Tools Svc screen, select 'System Configuration' and MENU.
(2) Select OK and press ENTER key.
(3) When you input '0' in the right side of 'Demo Mode', Demo mode is inoperative (Normal operation). When you input '1', Demo mode is operative and set values for temperature and CO2 density are displayed in Top Screen.

<PCB driver test mode> (Default: 0)

- This is the test mode to check PCB.

(1) In Select Tools Svc screen, select 'System Configuration' and MENU.
(2) Select OK and press ENTER key.
(3) When you input '0' in the right side of 'PCB Driver Test', PCB driver test mode is inoperative. When you input '1', PCB driver test mode is operative and will switch the drivers on and off in 3 seconds intervals.

(3) UV lamp Reset Timer

<Check for UV lamp life span>

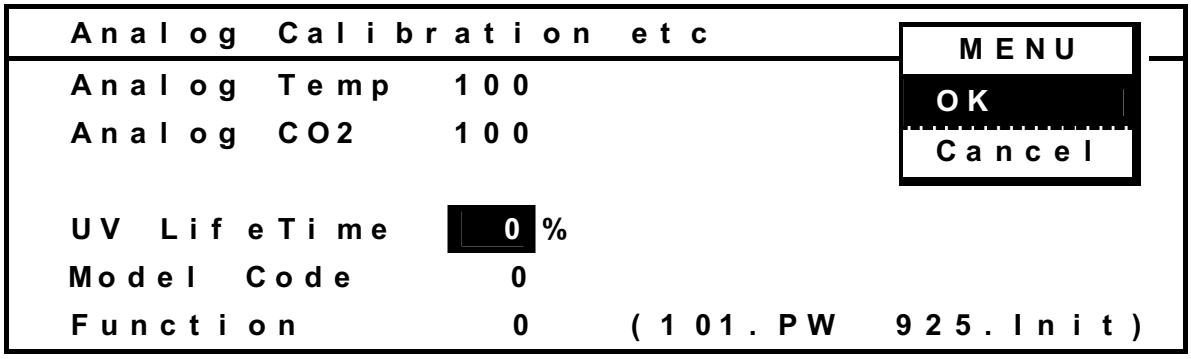
- You can check UV lamp life span in this mode. UV lamp life span is considered to be 1000 hours, which is regarded as 100% accumulated time.

(Ex. When 'UV Life' is 53%)

When the digit to the right side of 'UV LifeTime' is 53(%), it means that UV lamp accumulation time is 530 hours.

Calculation: 1000 hours x 0.53=530 hours

When UV lamp life span is over than 1000 hours, 'UV' in Top Screen blinks when UV lamp turns off.



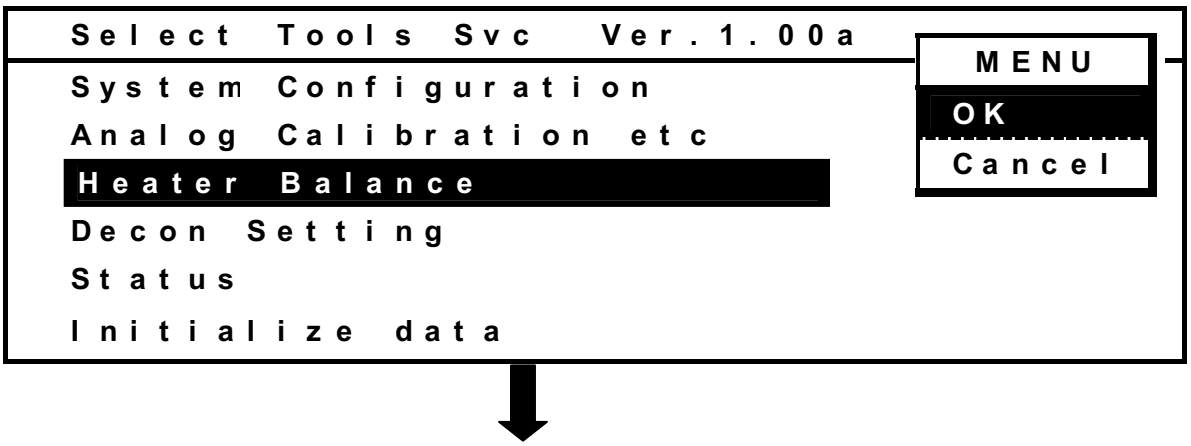
<Reset of UV lamp timer>

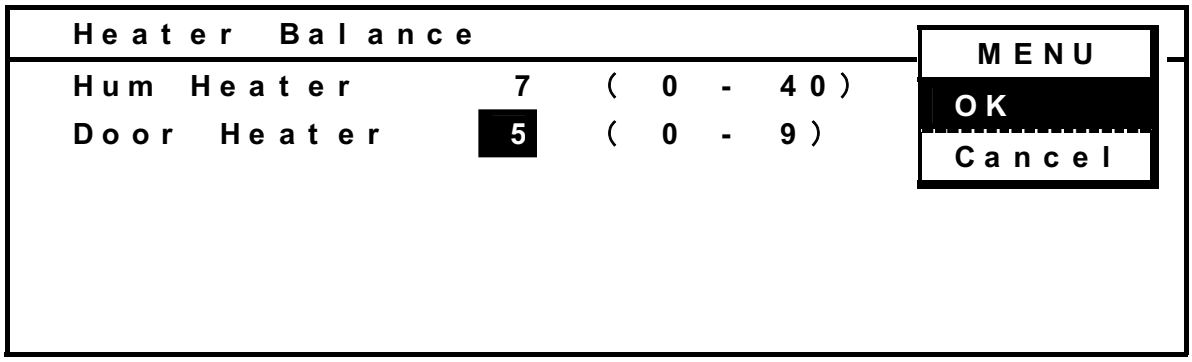
- You need reset UV lamp timer after UV lamp has been replaced.

(Ex. UV Life is '115' %)

	Operation	MENU
1	Top Screen	Tools
2	Select Tools (1/2) screen	Svc
3	In 'Password' screen, input '384' for service code.	OK
4	In Select Tools Svc screen, select 'Analog Calibration etc'.	OK
5	Change the digit '115' to '0' in the right side of 'UV Life' of Analog Calibration etc Calibration screen.	OK
6	Display automatically reverts to Select Tools Svc screen.	

(4) Adjustment for heater balance

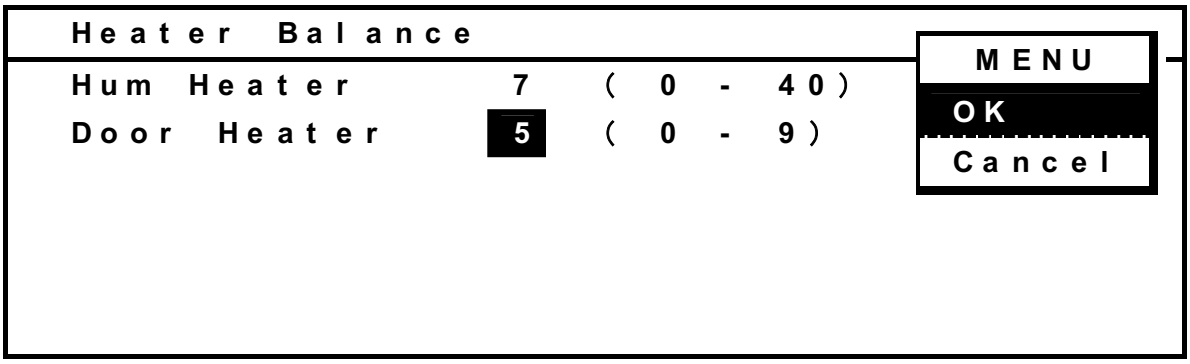




<Adjustment for bottom heater balance> (Default: 7)

・To prevent chamber condensation or to increase chamber temperature, adjust bottom heater output ratio.

(1) In Select Tools Svc screen, select 'Heater Balance' and MENU.
(2) Selsect OK and press ENTER key.
(3) Change the digits in the right side of 'Hum Heater' (Humidity Heater) on Heater Balance screen. Input range is 0～40.

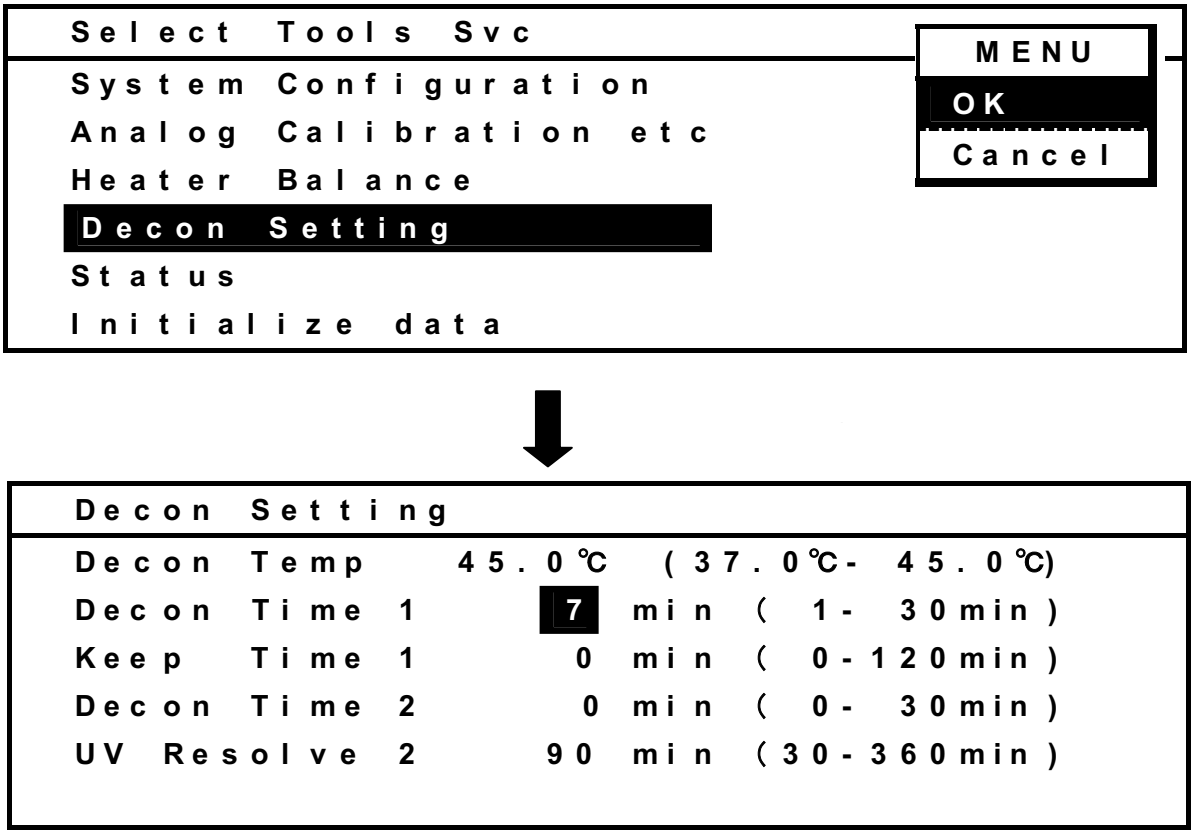


<Adjustment for door heater balance> (Default: 5)

- To prevent outer door condensation, adjust door heater output ratio.
  (1) In Select Tools Svc screen, select 'Door Balance' and MENU.
  (2) Select OK and press ENTER key.
  (3) Change the digits in the right side of 'Door Heater' of Heater Balance screen. Input range is 0～9.

(Note) Settable value is 9 at maximum if you input digits higher than 9.

(5) Setting of H_2O_2 decontamination time



<Setting of H_2O_2 decontamination temperature>（Default: 45.0℃）

Change the digits in the right side of ‘Decon Temp’ to set H_2O_2 decontamination temperature.
Setting range is 37.0～48.0℃.
Unit is in ‘Warming Up’ mode until decontamination temperature is reached to its setting temperature ±1.0℃ before H_2O_2 decontamination starts. Ultra-sonic oscillator is ON during primary H_2O_2 spray time.

（Note 1）If you input a value lower than 37.0℃, H_2O_2 decontamination temperature is set at 37℃.
If you input a value higher than 48℃, H_2O_2 decontamination temperature is set at 48℃.

（Note 2）If water sensor provides a ‘no water’ signal during H_2O_2 decontamination temperature setting, secondary H_2O_2 resolution mode is performed skipping the primary H_2O_2 resolution mode and secondary mist mode.

<Setting of primary H_2O_2 mist mode time（Decon Time 1）>（Default: 7 minutes）

Change the digits to the right side of ‘Decon Time 1” to set primary H_2O_2 mist time.
Setting range is 1~30 minutes.
Ultra-sonic oscillator is ON during primary H_2O_2 mist time.

（Note 1）If you input a value less than 1 minute, primary H_2O_2 mist time is set to 1 minute.
If you input a value more than 30 minutes, primary H_2O_2 mist time is set at 30 minutes.

（Note 2）If water sensor provides a ‘no water’ signal during primary H_2O_2 spray time setting, secondary H_2O_2 resolution mode is performed skipping the primary H_2O_2 resolution mode and secondary mist mode.

<Setting of primary H_2O_2 resolution time（Keep Time 1）>（Default: 0 minute）

Change the digits in the right side of ‘KeepTime 1’ to set primary H_2O_2 resolution time. (H_2O_2 density preservation time) Setting range is 0～120 minutes.

(Note) When you input a value more than 120 minutes, primary H_2O_2 resolution time is set to 120 minutes.

<Setting of secondary H_2O_2 spray mode time（DeconTime2）>（Default: 0 minute）

Change the digits to the right side of‘H2O2 Resolve 1’ to set secondary H_2O_2 mist time.

Settable range is 0～30 minutes.

（Note 1）If you input the value lower than 0 minute, secondary H_2O_2 mist mode time is set to 0 minute.
If you input the value higher than 30 minutes, secondary H_2O_2 mist mode time is set to 30 minutes.

(Note 2) If water sensor provides a‘no water’ signal, or secondary H_2O_2 mist time is setting time + 3minutes, secondary H_2O_2 resolution mode is performed.

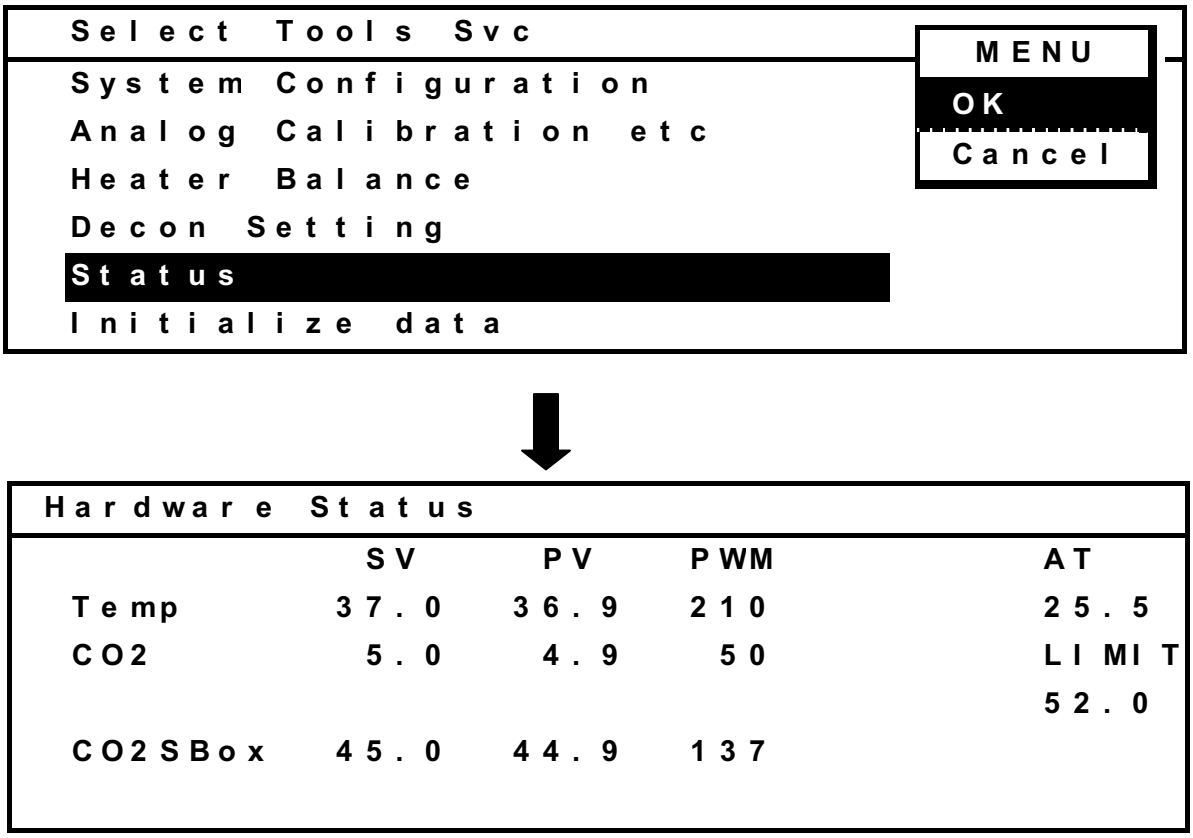
<Setting of secondary H_2O_2 resolution mode time（UV Resolve）>（Default: 90 minutes）

Changing the digits to the right side of‘UV Resolve’ to set secondary H_2O_2 resolution mode itme.

Settable range is 1～360 minutes.

（Note）If you input the value more than 360 minutes, secondary H_2O_2 resolution mode time is set to 360 minutes.

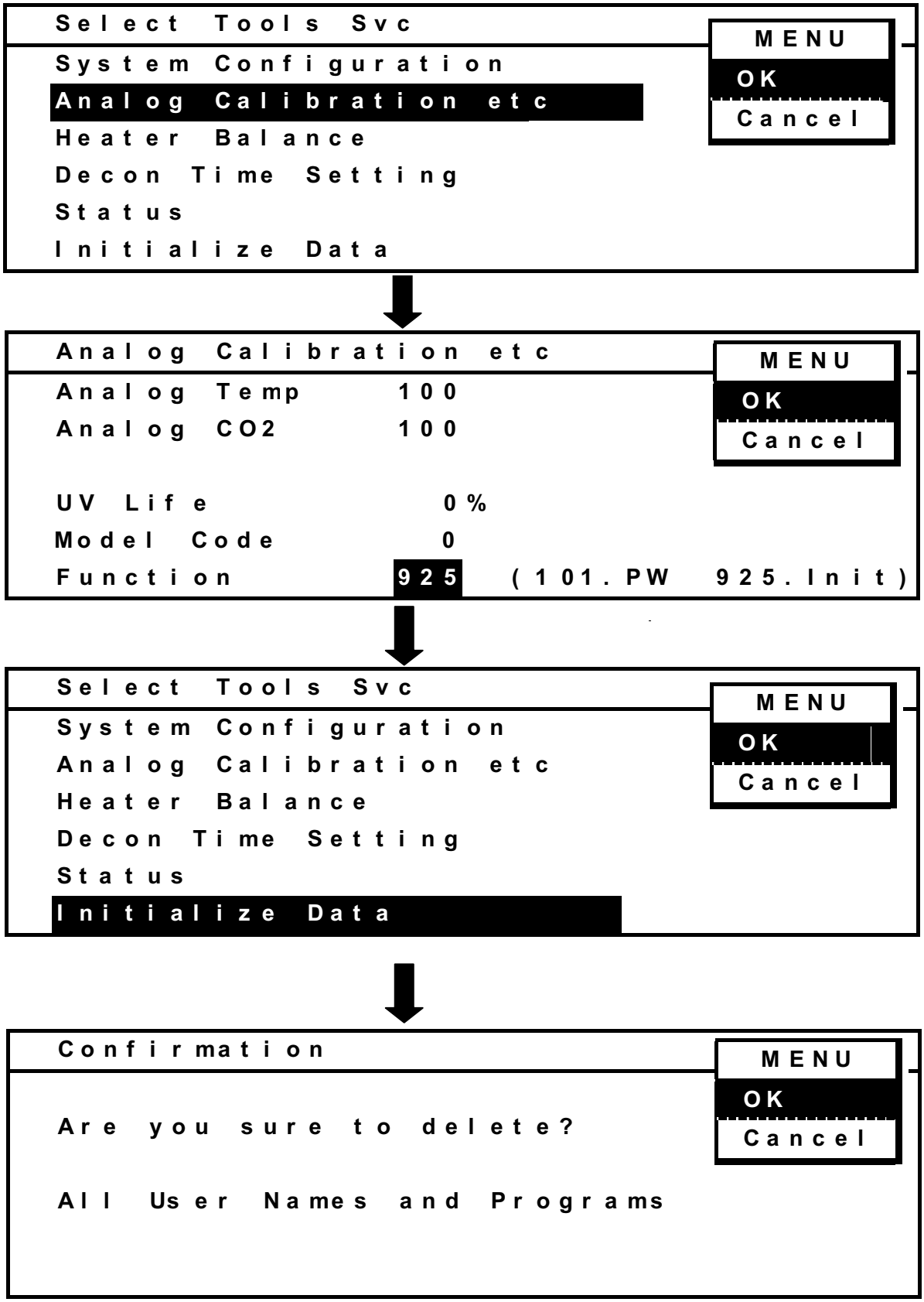
(6) Status (Display of sensor status)



<Status check>

(1) Input service code.
(2) Select MENU and OK and press ENTER key.
(3) Select 'Status' in Select Tools Svc screen and MENU.
(4) Select OK and press ENTER key to display 'Hardware' screen. You can check setting temperature, current chamber temperature, CO_2 setting density, current CO_2 setting density, CO_2 sensor BOX setting temperature and current CO_2 sensor BOX temperature.

(7) Initializaion of non-volatile memory



(7) Initialization of non-volatile memory

<Initialization of non-volatile memory (Initial data)>

(1) Select 'Analog Calibration etc' in Select Tools Svc screen.
(2) Select MENU and OK and press ENTER key.
(3) Input '925' to the right side of 'Function' in Analog Calibration etc screen.
(4) Select MENU and OK and press ENTER key.
(5) Select 'Initialize data' in Select Tools Svc screen.
(6) Select MENU and OK and press ENTER key. The message 'Are you sure to delete?' is displayed.
(7) Select MENU and OK and press ENTER key.
(8) The message 'Remain' and 'Waiting default value' are displayed in the lower left side of screen.
(9) Display automatically reverts to Top Screen. If you cancel during the process, the display reverts to Select Tools Svc screen.

<Default setting values>

Item	Default setting	Remarks
Chamber temp.	37.0℃	
Chamber CO_2 density	0.0%	
UV lamp lighting period	0 minute	
Chamber temp. zero calibration	0.5℃	
Log interval	6 minutes	
CO_2 zero calibration	500	Coefficient
CO_2 span calibration	700	Coefficient
CO_2 sensor reference cell voltage	4000mV	
CO_2 sensor gas cell voltage	4000mV	
LCD backlight color	0	0: Blue,1:White
DAQ mode	0	0: Local,1:Remote
UV 24hours mode	0	0: OFF,1:ON
Remote alarm	1	1: Not linked with buzzer 0: Linked with buzzer
Key lock	0	0: OFF 1.: ON
DAQ communication speed	0	0:2400bps 1:9600bps 2:19200bps
DAQ communication ID	0	
High/low temp. alarm	±1.0℃	
CO_2 high/low density alarm	±1.0%	
Alarm delay time	15 minutes	
Alarm resume time	30 minutes	
Door alarm delay time	2 minutes	
Bottom heater balance	7	
Door heater balance	5	
Key lock password	0000	
Primary H_2O_2 mist time	7 minutes	
Primary H_2O_2 resolution time	0 minute	Naturally resolution
Secondary H_2O_2 mist time	0 minute	
Secondary H_2O_2 resolution time	90 minutes	UV resolution time
Decontamination temp.	45.0℃	
Demo mode	0	0:OFF,1:ON
CO_2 auto changer (Option)	0	0:OFF,1:ON
Standard gas calibration (Option)	0	0:OFF,1:ON
Decon mode	0	0:OFF,1:ON
UV lamp (Option)	0	0:OFF,1:ON
PCB test mode	0	0:OFF,1:ON
CO_2 valve control during auto changer mode	0	0:Valve A 1:Valve A and B
UV lamp span	0 minute	
CO_2 density of standard gas tank	5.0%	

Prevention of contamination

In servicing for CO_2 incubator, it is important to prevent from contamination.

(1) More than 90% of contamination in CO_2 incubator is caused by mold. Mold is a kind of true fungi, it has high increasing power under high temperature and high humidity. Accordingly, it is easy for mold to increase inside CO_2 incubator. Those increased mold eat up culture (mainly animal cell), eventually precious test sample will be killed. Cell that is independent from ecosystem is also independent from immune system, it has no immunocompetence at all.

(2) Precautions for mold increasing

There are many cases that mold is increasing by eating fat on the fingers as a source of nutrient in CO_2 incubator.

Therefore,

①Be sure to wash and sterilize your hands prior to servicing. Use 70% ethanol.

②In installing, sterilize the inside wall and shelves after removing shelves, duct, humidifying pan and so on with 70% ethanol.

(3) In the case that mold is already increasing.

Sterilize the interior (walls) and shelves with 70% ethanol after removed all items from the chamber as same as (2)-② above.

And you should sterilize again after 24 hours once sterilized, when the root of spore is geminated, because it is too difficult to remove spore of mold. Repeat sterilization is effective.

NOTICE

In general, stainless steel is known that it is not easy（hard）to rust.

However depends on the conditions, rust might generate.

When you remove rust, we recommend the following agents.

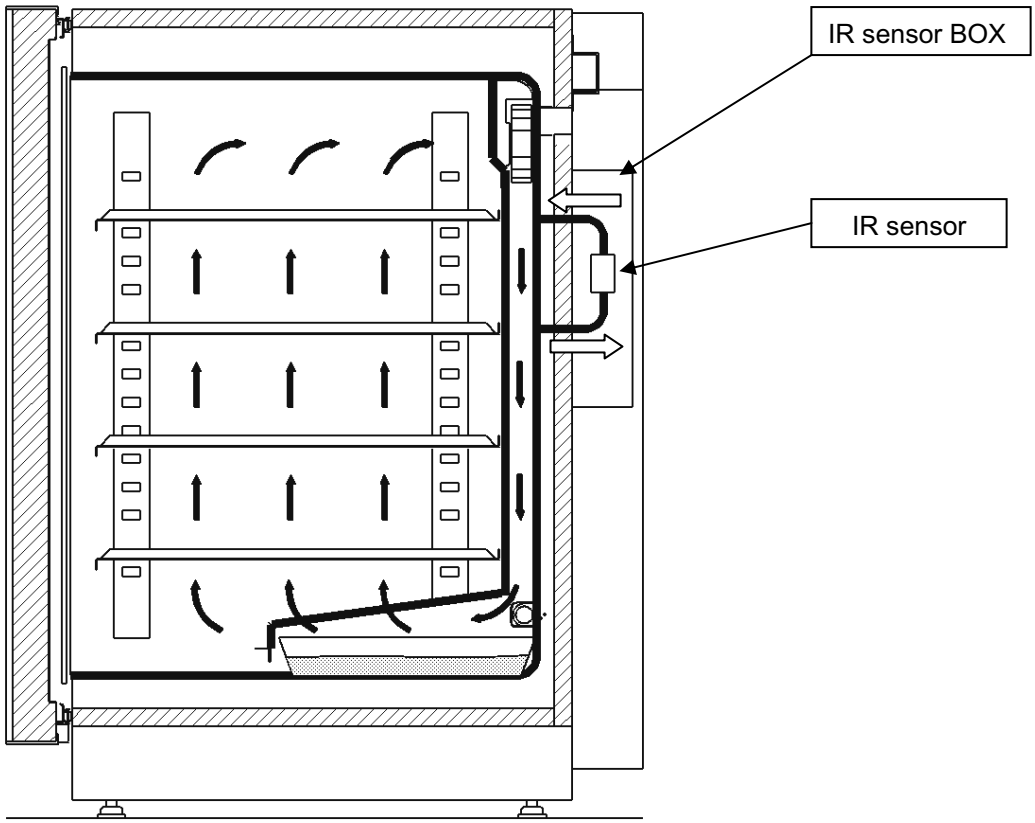
Besides, the surface may become foggy.

Recommended agent:

1. Cream cleanser「Gif」（Nippon Leva）
2. Picasso #SUS300-W（Chemical YAMAMOTO）

＜Picasso has greater capability of clean for rust than Gif.＞

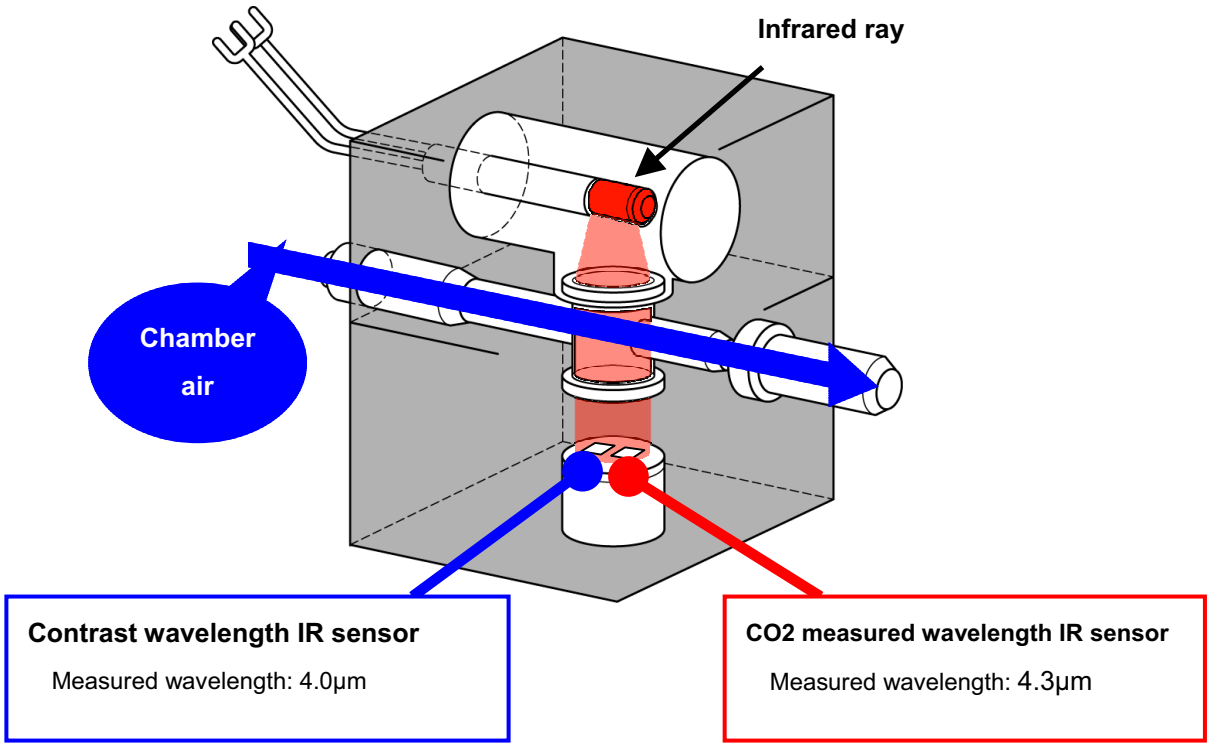
Principle of chamber air circulation



The direction of air flow to the IR sensor should be from bottom to top through IR sensor. The air flow volume is too slight to measure with the air flow meter.

The principle can be explained as follows;
The air flow inside duct is top down, and the part of two holes connected to the IR sensor via tubes is negative pressure. And the air inside tube is drawn from the lower hole because there is the difference in the pressure level of two holes due to the pressure loss inside chamber duct, and the pressure around the upper hole is more negative than one around the lower hole.
It is sure that the air inside chamber constantly flows to the IR sensor and is measured its CO2 level with the IR sensor timely because the CO2 recovery speed of MCO-19AIC is same as that of MCO-18AIC.

Mechanism for Double wavelength IR sensor



Double wavelength (4.0 μ m adding to 4.3 μ m) are measured simultaneously in this IR sensor.

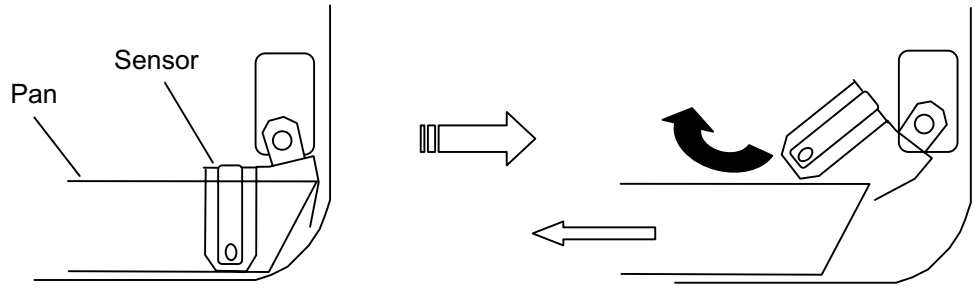
Higher accuracy can be obtained by comparing both of measured wavelengths constantly in the same temperature condition.

It is unnecessary to inject ambient air to perform zero calibration in every 4 hours as previous models performed.

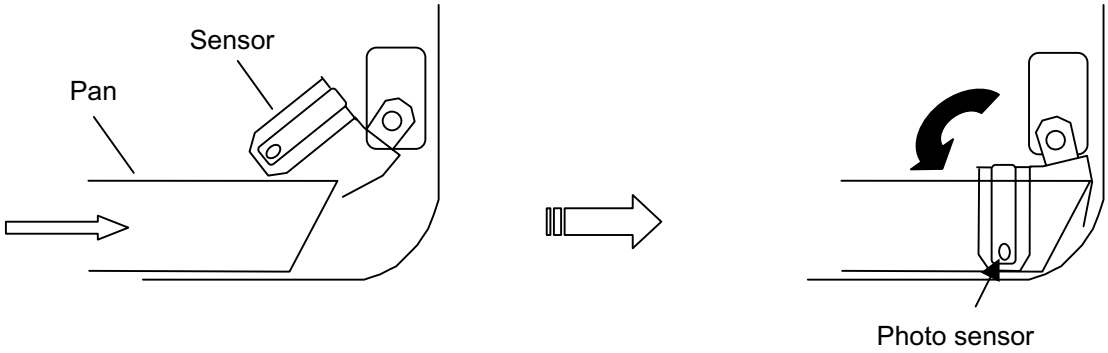
Water sensor

This Incubator is equipped with a water level sensor for the humidifying pan. The sensor is set automatically when the humidifying pan is installed. Take care not to damage the sensor when removing or installing the humidifying pan.

When the humidifying pan is removed (side view)



When the humidifying pan is installed (side view)



Note: Make sure that the humidifying pan is all the way to the back and that the sensor comes down when you install the humidifying pan.

- Lift the sensor before installing the humidifying pan if the sensor is in the lower position after maintenance.
- When installing the humidifying pan, make sure that the pan is set properly and that sensor comes down into the pan. “RH PAN” will be displayed in reverse video in the status display field on LCD panel if the sensor does not come down completely. If necessary, set the pan again in the proper location.
- The sensor detects the water level every 30 minutes and just after the outer door is closed. It takes several seconds to detect the water level. Therefore, “RH PAN” may displayed in reverse video several times in the status display field on LCD panel after the outer door is closed even when the humidifying pan is full.

CAUTION

Foreign particles on the water surface can adhere to the water level sensor and fittings by capillary action because the sensor is always in the water. The adhered foreign particles degrade sensor performance and “RH PAN” may displayed in reverse video in the status display field on LCD panel even though there is sufficient water in the humidifying pan. Be sure to wipe OFF any dirt on the water level sensor with disinfectant alcohol whenever you change the humidifying water. When cleaning the sensor, take care not to apply excessive force to the lead wires.

When cleaning the sensor, mainly wipe OFF dirt on the right side of photo sensor (where red LED is lit when the door switch pressed).

Specification of sensor

■ Temperatures and resistances of temperature sensor (Type:103AT-1)

Temperature (℃)	Resistance value (kΩ)	Temperature (℃)	Resistance value (kΩ)	Temperature (℃)	Resistance value(kΩ)
0	27.28	17	13.57	34	7.19
1	26.13	18	13.06	35	6.94
2	25.03	19	12.56	36	6.70
3	23.99	20	12.09	37	6.47
4	22.99	21	11.63	38	6.25
5	22.05	22	11.20	39	6.03
6	21.15	23	10.78	40	5.83
7	20.29	24	10.38	41	5.63
8	19.48	25	10.00	42	5.44
9	18.70	26	9.63	43	5.26
10	17.96	27	9.28	44	5.08
11	17.24	28	8.94	45	4.91
12	16.55	29	8.62	46	4.75
13	15.90	30	8.31	47	4.59
14	15.28	31	8.02	48	4.44
15	14.68	32	7.73	49	4.30
16	14.12	33	7.46	50	4.16

■ CO2 density and output voltage of CO2 sensor (Type: IR sensor)

* Values are the reference only.

CO_2 density (%)	Output voltage (V)	CO_2 density (%)	Output voltage (V)	CO_2 density (%)	Output voltage (V)
0.0	4.00	8.0	3.14	16.0	2.88
1.0	3.82	9.0	3.10	17.0	2.85
2.0	3.63	10.0	3.06	18.0	2.83
3.0	3.49	11.0	3.02	19.0	2.81
4.0	3.39	12.0	2.99	20.0	2.78
5.0	3.31	13.0	2.96		
6.0	3.25	14.0	2.93		
7.0	3.19	15.0	2.90		

* R40 on Main PCB

Parts layout

Control panel

Sample air outlet

<Control panel & keypad>

LCD display

Door switch

Tray

Electric lock (Option)

<Electric lock> (Option)

Tray support (⌝ shaped)

Tray (⌞ shaped)

When MCO-HP is uninstalled

Covered by plate

When MCO-HP is installed

Silicone cap attached
during H_2O_2 decontamination

<Rear right side>

Connecting port A/B
for CO_2 gas pipe

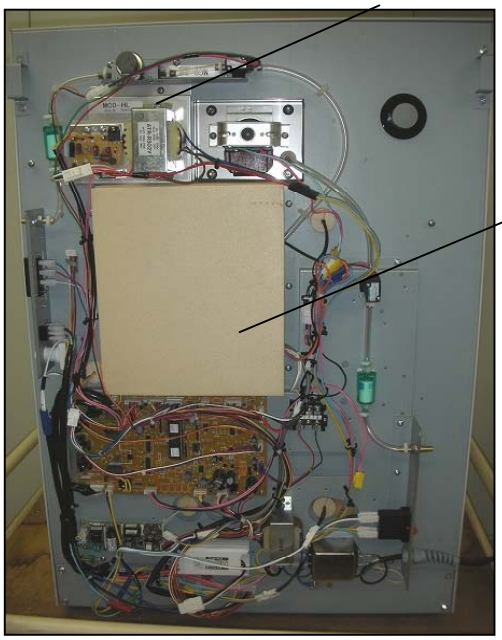
Power switch

Power cord

Remote alarm terminal

Glow starter for UV lamp (When UV lamp is installed)

<Rear side（Option installed）> H_2O_2 generator (MCO-HP)

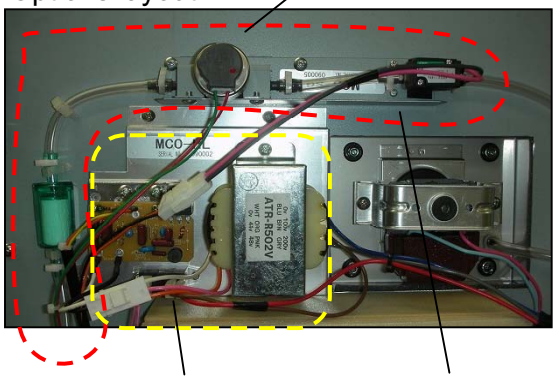


Sensor BOX

<Rear side（Option uninstalled）>

<Options layout>

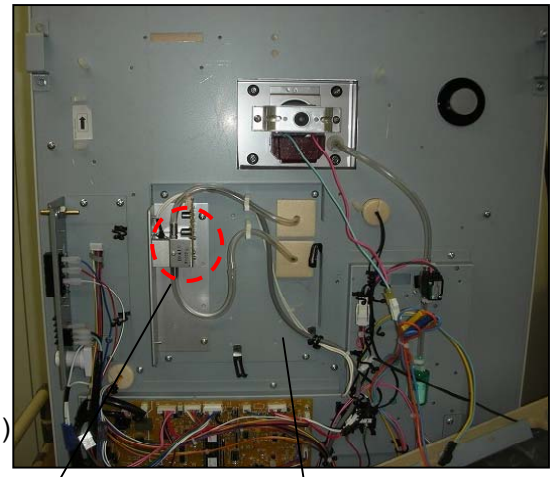
H_2O_2 generator (MCO-HP)



H_2O_2 decontamination kit (MCO-HL)

Automatic CO_2 density calibration add-on kit (MCO-SG)

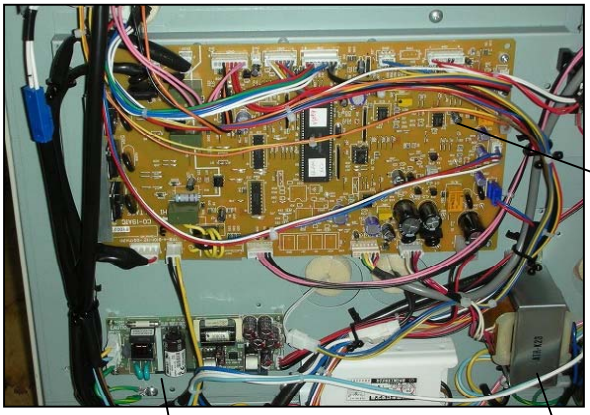
<Rear side（Option uninstalled）>



CO_2 sensor

Tubing (Sensor BOX cover removed)

<Lower rear side>



Main PCB

DC5V power supply

Power transformer

Initial setting of options

For MCO-19UVS, MCO-HL, MCO-HP, MCO-SG

1. How to set optional functions in control panel

(1) Service code input

#	Operation	Key	Display
1		-----	Top Screen
2	Press MENU key.	MENU	Menu window
3	Select Tool and press ENTER key.	ENTER	Select Tool screen
4	Press MENU key.	MENU	Menu window
5	Select SVC and press ENTER key.		Password input screen
6	Input service code '384' by numeric keys.	Numeric key	
7	Press MENU key.	MENU	Menu window
8	Select OK and press ENTER key.	ENTER	Service mode (Select Tools Svc)

Note) If you input wrong service code, 'Wrong Password' is displayed under the 'Password' on the screen and error tone is emitted. Service code is unchangeable.

(2) Setting of option

#	Operation	Key	Display
1		-----	Service mode (Select Tools Svc)
2	Select System Configuration and press ENTER key.	ENTER	System configuration window
3	Select item* from System Configuration and input '1' by numeric key.	Numeric key	Menu window
4	Press MENU key.	MENU	Menu window
5	Select 'OK' and press ENTER key.	ENTER	

* Item in System Configuration

Option name	Item in System Configuration
UV lamp add-on kit (MCO-19UVS)	UV Function
H_2O_2 generator (MCO-HP), H_2O_2 Decontamination kit (MCO-HL)	Decon Function
Automatic CO_2 Standard Gas Calibration Kit (MCO-SG)	Std Gas Cal Function
Automatic CO_2 Cylinder Changeover System (MCO-21GC)	CO_2 Gas AutoChanger

2. How to activate optional function

(1) UV lamp add-on kit (MCO-19UVS)

- Setting

#	Operation	Key	Display
1		-----	Top Screen
2	Press MENU key.	MENU	Menu window
3	Select Tool and press ENTER key.	ENTER	Select Tool screen
4	Select 'UV Setting' and press ENTER key.	ENTER	UV setting screen
5	Select 'UV Timer' and input setting period by numeric keys. Press ENTER key.	Numeric keys ENTER	
6	Press MENU key.	MENU	Menu window
7	Select 'OK' and press ENTER key.	ENTER	

Note 1) UV lamp lighting time range is 0~30 minutes. Default setting is '0' (UV lamp is not lit).

2) UV lamp goes off when you open door during UV lamp is lit. UV lamp is lit in specified time with the door shut.

3) When you set 5 minutes or longer for UV lamp lighting time, or open and shut door repeatedly, it may be caused condensation or bad temperature distribution, or UV lamp lifetime shorten by heat emitted from UV lamp itself. Consult a SANYO representative or agent for UV lamp replacement.

4) UV lamp stays lit longer than preset period, because UV lamp lighting time is automatically extended for the compensation of reducing UV ray output by adding UV lamp accumulating time.

- UV lamp operation check

#	Operation
1	With outer door open and inner door shut, press door switch.
2	After several seconds elapse, check if 'UV indicator' should be displayed on LCD display.
3	You can see blue ray at the front of humidifying tray cover. **Do not look UV ray directly.**

(2) H_2O_2 generator (MCO-HP), H_2O_2 Decontamination kit (MCO-HL)

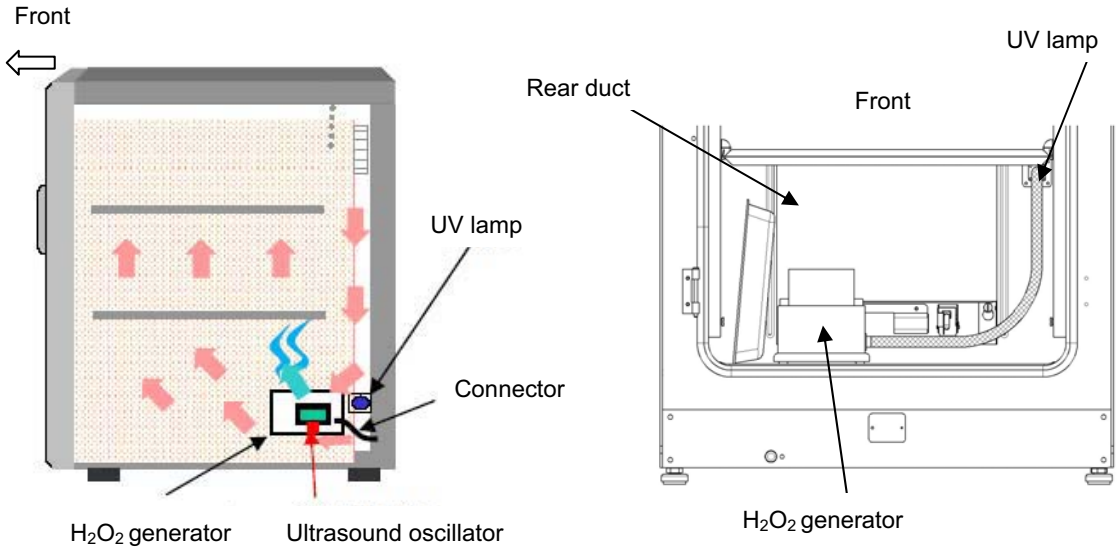
- Installation

Pour about 80cc of distilled water into MCO-HP. Using the cable enclosed, connect MCO-HP with the connector on the bottom right of the chamber.

Set MCO-HP in the rear duct. (See picture as below)

Ensure 2 pins of MCO-HP should be set in the holes of rear duct. If it is set wrongly, it may be obtained poor spray performance. Ensure to keep connector cap in safe place.

Ensure to fix door switch by tape to check if spray performance is obtained correctly.



- Check for operation

#	Operation	Key	Display/Remark
1		-----	Top Screen
2	Press H_2O_2 key for 5 seconds.	H2O2	H2O2 Decontamination (System check starts)
3			H2O2 Decontamination screen 'H2O2 Decon' blinks
		-----	(If error message is shown, refer to Instruction Manual P.43.)
4	Ensure outer door should be locked by electric key.	-----	
5	Open outer door by using key to check spray performance is correctly obtained.	-----	Turn key toward the direction when you locked and take key off before door shut. You cannot turn the key with the door shut.

- Forcible stop for decontamination

#	Operation	Key	Display/Remark
1	Turn the unit off and on.	Power switch	H2O2 Decontamination
2	With 'Warming up' displayed, press MENU key and select 'about' and press ENTER key.	MENU ENTER	Decontamination mode retrieves if you operate #2 without 'Warming up' displayed.
3	Remove MCO-HP and press MENU key and ENTER key.	MENU ENTER	Top Screen
4	Ensure electric lock should be unlocked.		Ensure outer door should be opened.

(3) Automatic CO_2 Standard Gas Calibration Kit (MCO-SG)

- Standard CO_2 density setting

#	Operation	Key	Display
1		-----	Top Screen
2	Press MENU key.	MENU	Menu window
3	Select Tool and press ENTER key.	ENTER	Select Tool
4	Select 'Standard Gas setting' on page 2. Press ENTER key.	ENTER	Standard Gas Setting screen
5	Input standard gas density by numeric keys.	Numeric key	
6	Press MENU key.	MENU	Menu window
7	Select 'OK' and press ENTER key.	ENTER	

- CO_2 density calibration

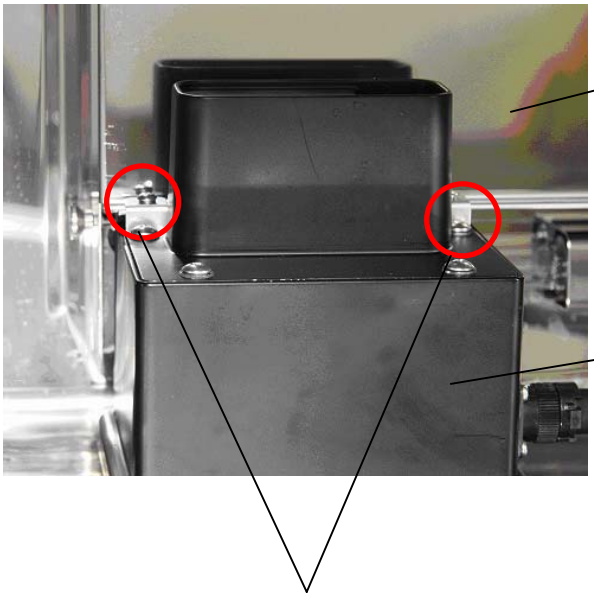
#	Operation	Key	Display/Remark
1		-----	Top Screen
2	Press MENU key.	MENU	Menu window
3	Select Tool and press ENTER key.	ENTER	Select Tool
4	Select 'Standard Gas calibration' on page 2. Press ENTER key.	ENTER	Standard Gas Calibration screen (System check starts)
			Confirmation screen to start calibration
5	Select 'OK' in Menu window and press ENTER key.	ENTER	Unit starts CO_2 density calibration
6			Top Screen (After calibration completed)

Notes for installation of H_2O_2 Generator (MCO-HP)

Ensure to read the following notes prior to use H_2O_2 Generator.

Checks after installation

- Is the fan (inside duct) correctly installed？
- Is the inside duct correctly installed？
- Are the 2 pins on the H_2O_2 Generator correctly set in the 2 holes on the lower left side of the inside duct？（See the picture below.）



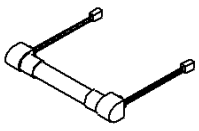
＊After installation, ensure H_2O_2 Generator should not be moved.

Error message

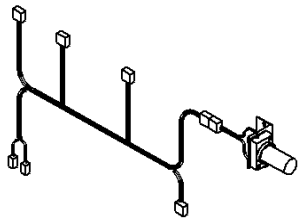
- If you find an error message, ‘Err34’, after specified decontamination time expires, please consult to your authorized sales representative.
  H_2O_2 generating time will be adjusted when the power supply is out of the factory specification.

How to install UV lamp add-on kit (MCO-19UVS)

Kit includes:



① 1 UV lamp



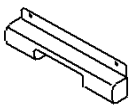
④ 2 Glow ass'y

⑦ 1 UV label
(Unused for MCO-19AIC)

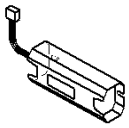
⑧ 1 UV caution label

⑨ 1 UV door switch caution label

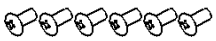
⑩ 5 Name plate



② 1 UV lamp cover



⑤ 1 Ballast



③ 6 Screws (M4)

1. Unplug the unit and make sure that power is not supplied to the unit.

2. Remote the duct from inside the unit, then take 2 caps and 2 screws off as shown in Fig.1

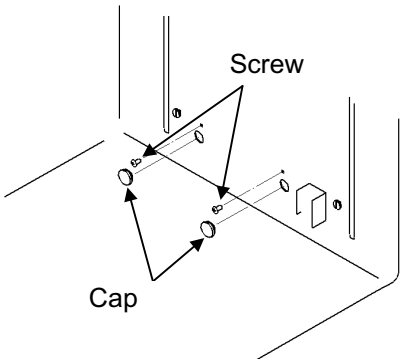


Fig. 1

3. Take the rear cover off as shown in Fig. 2.

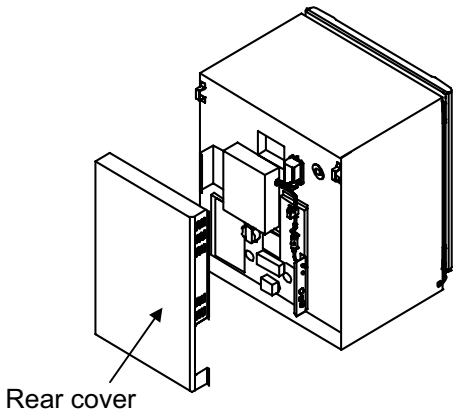


Fig. 2

4. Take 2 insulations out for the UV lamp lead wire hole as shown in Fig. 3. Insulations can be easily taken out by pushing it from inside of the chamber. Keep them for reuse.

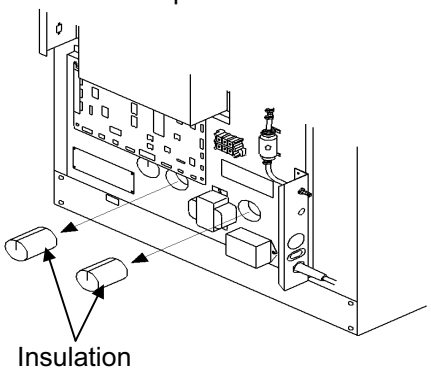


Fig. 3

5. Set the UV lamp (①) to the hotel and make sure to fit correctly. Fix the UV lamp cover (②) by 2 screws (③).

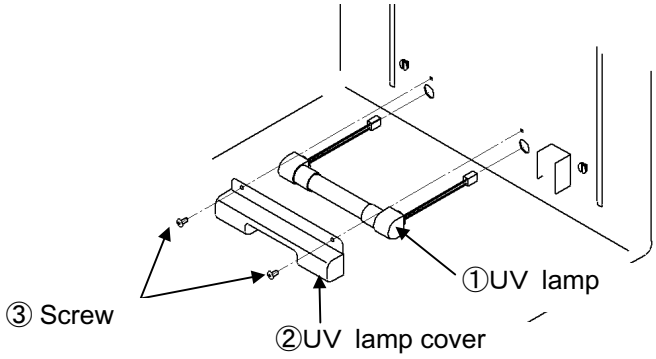


Fig. 4

6. Fit the duct to original position.
Place the humidifying tray and set the humidifying tray cover as shown in Fig. 5.

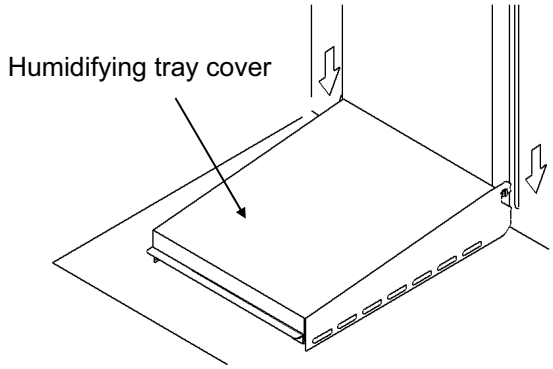


Fig. 5

7. Replace the insulations into the UV lamp lead wire hole with the wires passed through the cuts on both insulations. See Fig. 6.

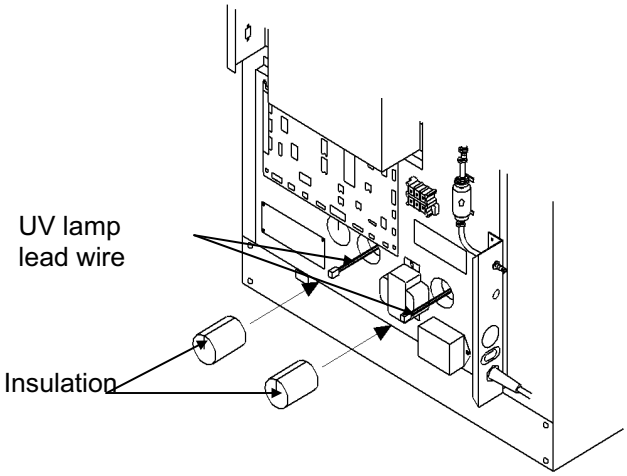


Fig. 6

8. Remote the 2 caps shown in Fig. 7.
Fit Glow Ass'y (④) and Ballast (⑤) by using 4 screws (③).

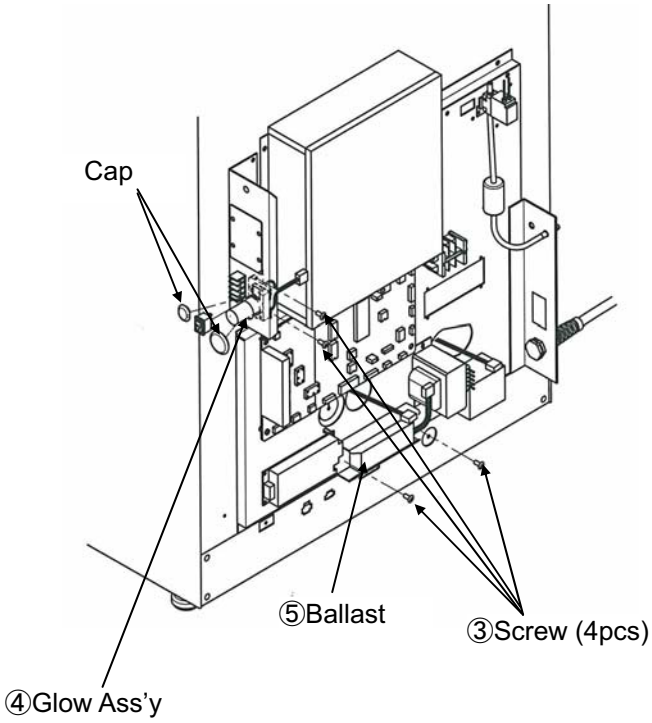


Fig. 7

9. Connect each lead wire connectors of Ballast and Glow Ass'y as shown in Fig. 8

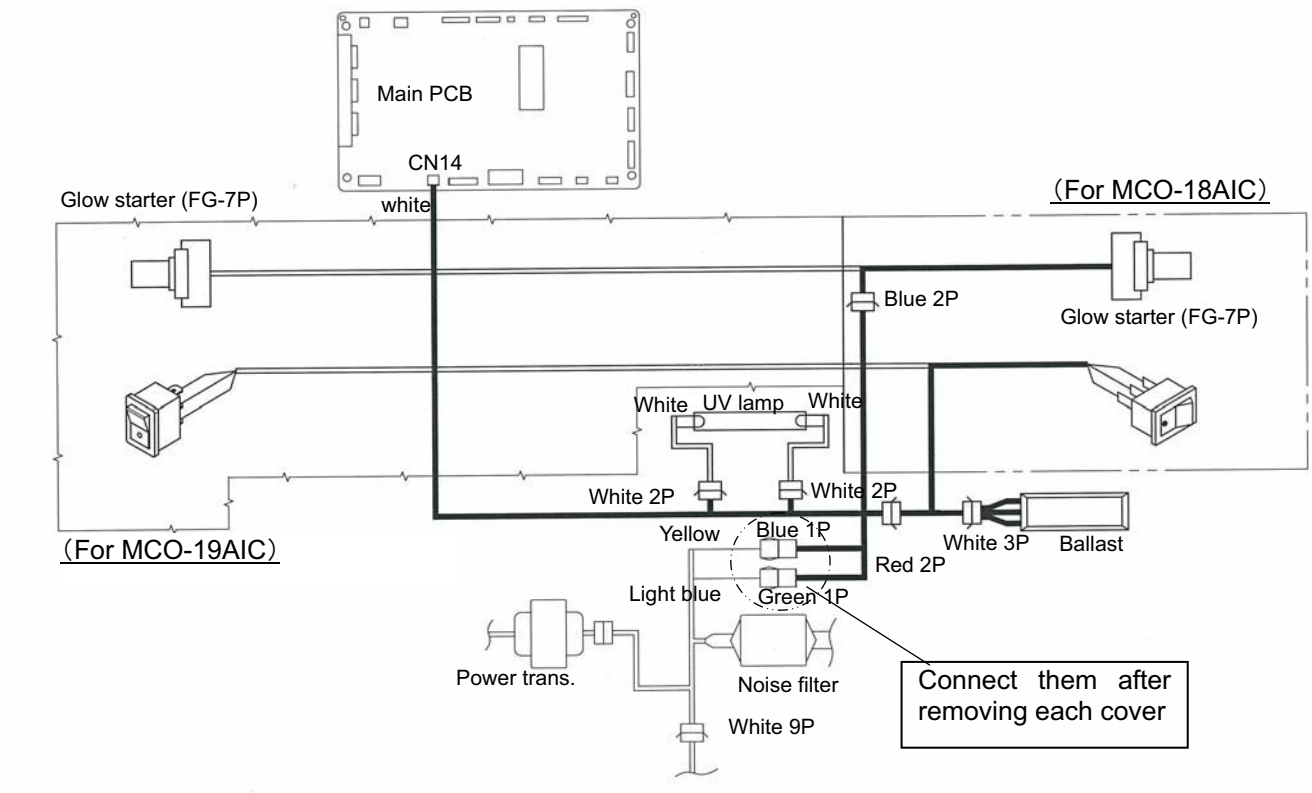


Fig. 8

10. Labels layout

Put each label on the specified place. Use the name plate of MCO-19AIC(UV) for MCO-19AIC.

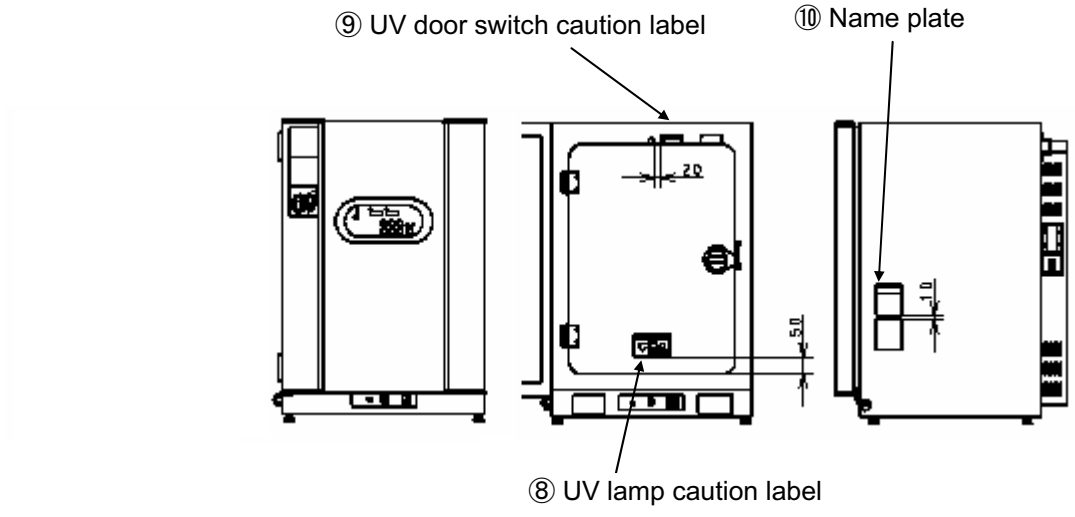
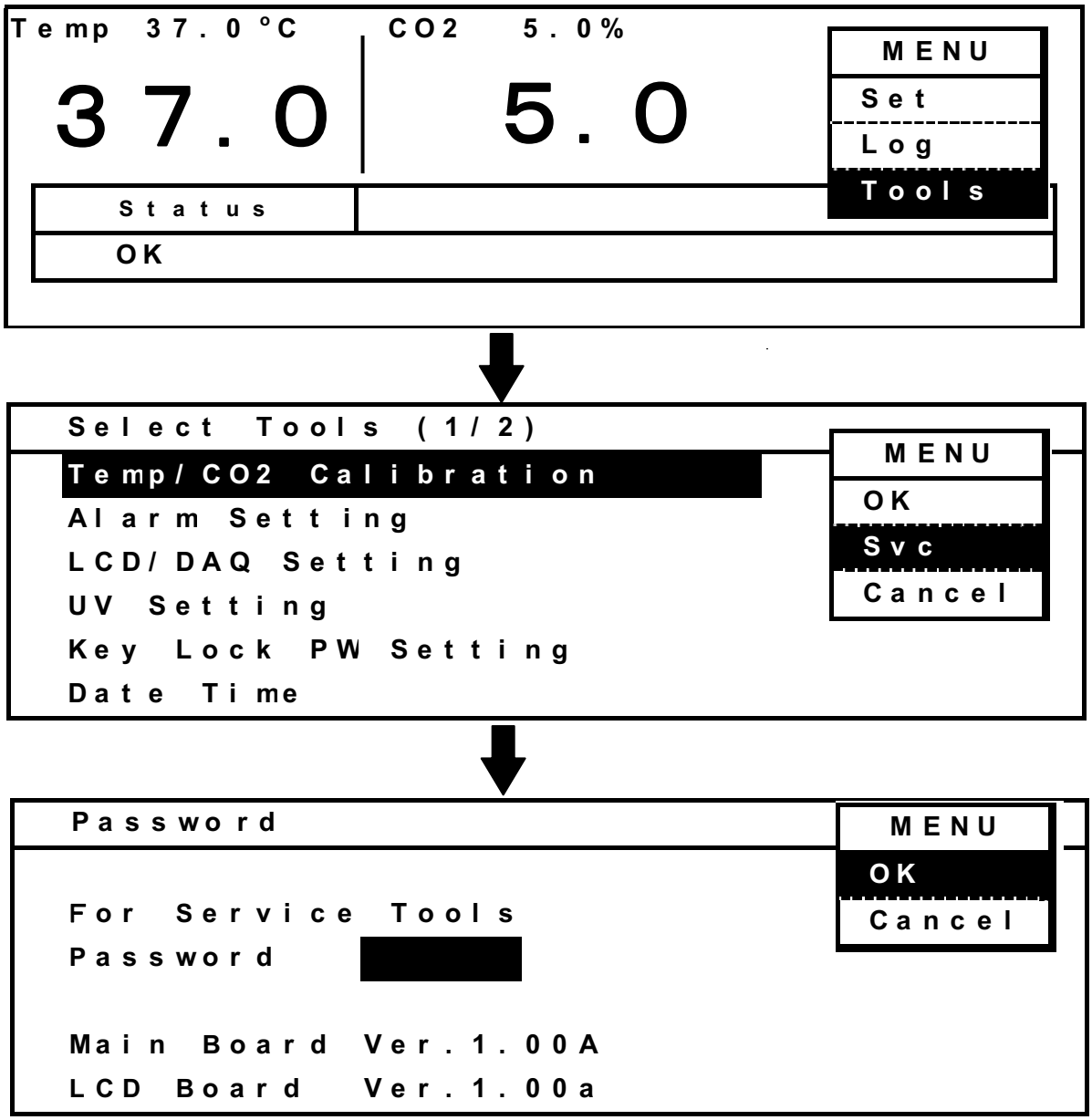


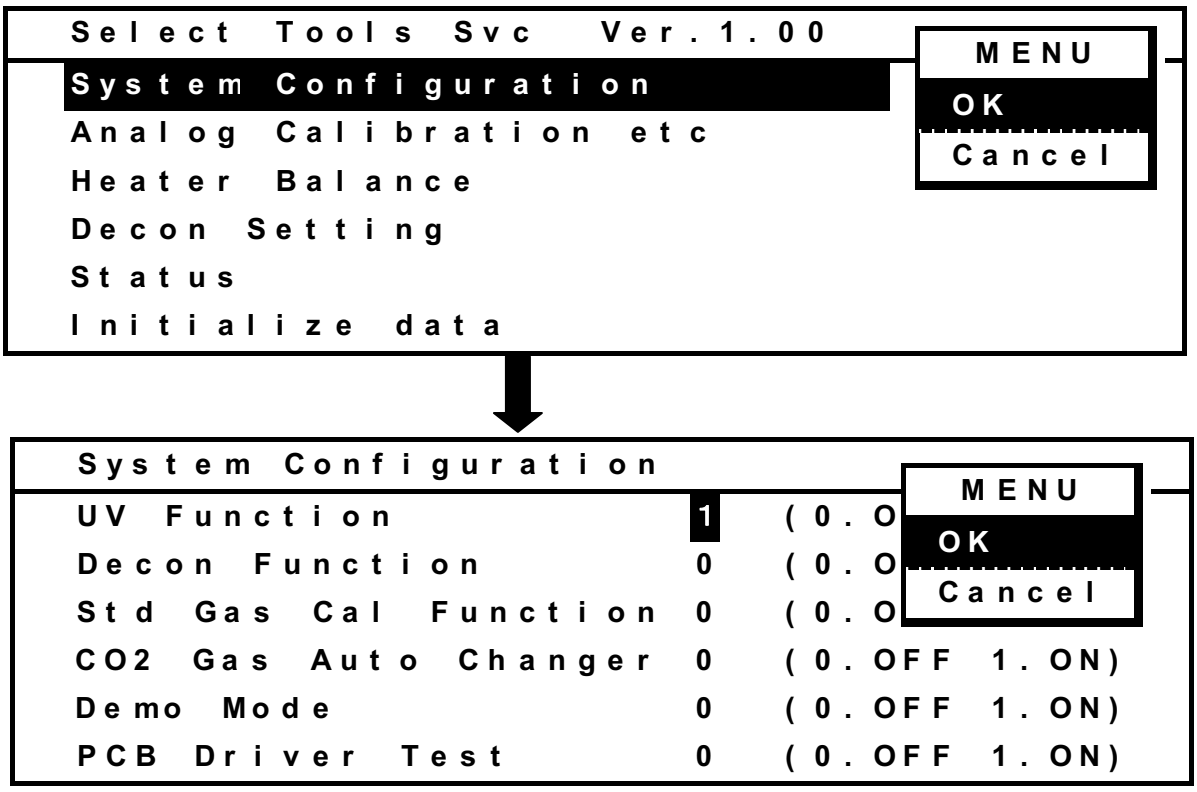
Fig. 9

11. How to set UV lamp lighting period



①[Service mode（Svc）]
Select MENU→Tools in Top screen and select MENU→Svc and press ENTER key to call 'Password input screen'. Input '384 ' for password.

(Note) The message 'Wrong Password'is displayed with error tone emitted when you input wrong password. You cannot change service code.



②How to set UV lamp optionally (UV Function)

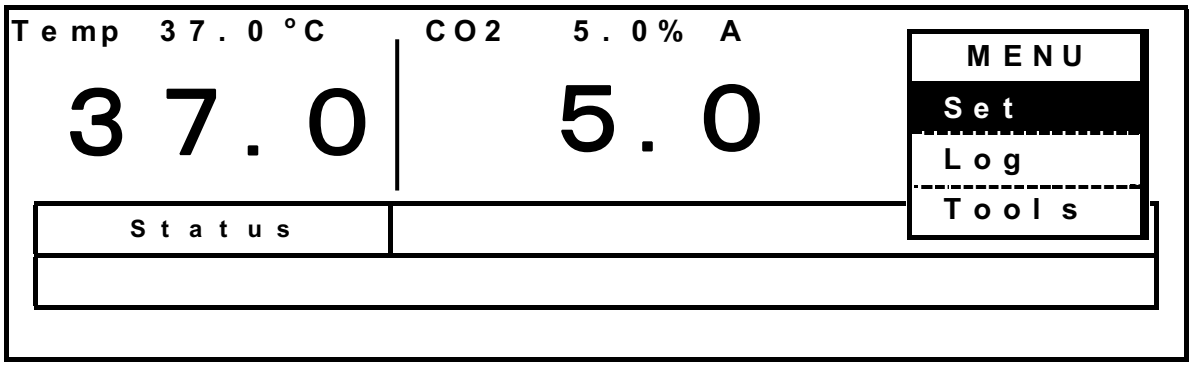
In Select Tools Svc screen, select 'System Configuration' and MENU→OK(ENT) to display UV lamp optional setting screen.

When you input '1' for UV Function, you can set UV lamp lighting period.

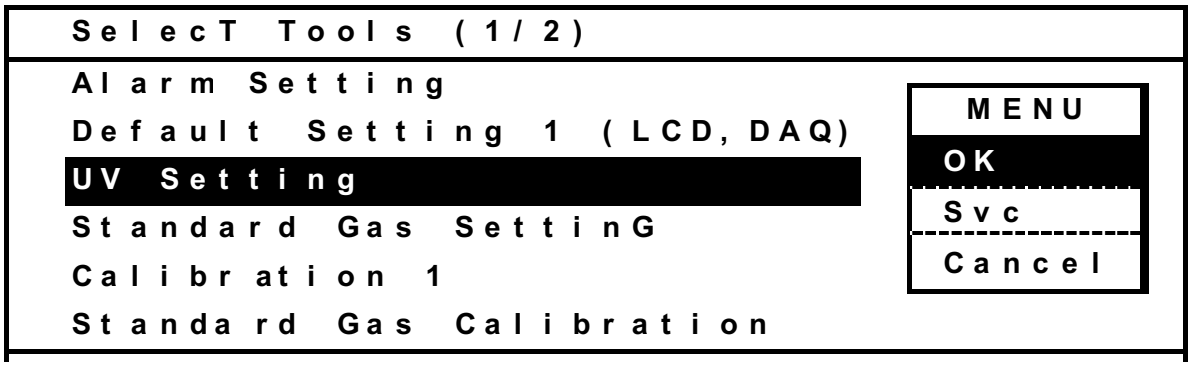
(Note) <u>You cannot enter 'UV Setting' screen in Select Tools(1/2) without UV lamp is optionally set. Automatically reverts to Top screen.</u>

③How to activate UV lamp operation

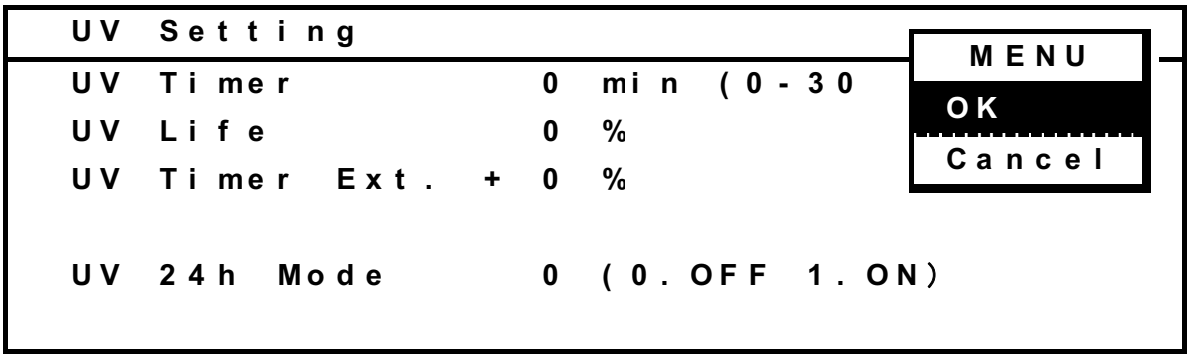
In Top screen press MENU to call MENU window. Select Tools and press ENTER key.



④ In Select Tools screen, select UV Setting and press MENU button.
Select OK and press ENTER key to call UV setting screen.



⑤ UV lighting period（UV Timer） setting



- The range for setting UV lighting period（UV TIMER） is 0～30 minutes. Default setting is 0. (UV lamp is not lit).
- Set 5 minutes for UV lighting period（UV TIMER）.
- UV lamp is lit during specified period after outer door is shut. UV lamp goes off if you open the door during UV lamp is lit.
- Please note it may be caused condensation or chamber temperature may be unstable by the heat emitted from UV lamp when you set UV lamp lighting period over 5 minutes or open and shut outer door frequently. It may be also caused shorten the UV lamp life. Consult to your sales agents when you replace UV lamp.
- UV lamp may be lit longer than your specified period because UV lamp would be extended to be lit automatically to compensate for UV output being lower.

12. How to check UV lamp lighting

	Operation
1	Press door switch with the inner door shut and the outer door opened.
2	Several seconds later, check if UV indicator on the control panel is lit. Check if ‘UV’ is appeared on LCD screen.
3	Check if you can see blue ray at the front of humidifying pan cover. You should check UV ray with inner door shut. Never look UV ray directly for your eyes prevention.

How to install H_2O_2 decontamination kit（MCO-HL） and Electric lock

■Parts enclosures

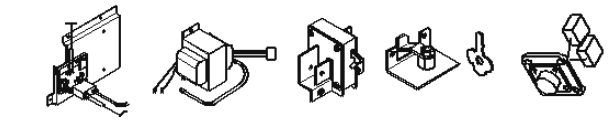
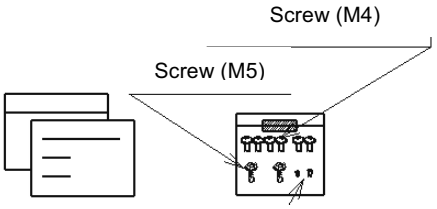


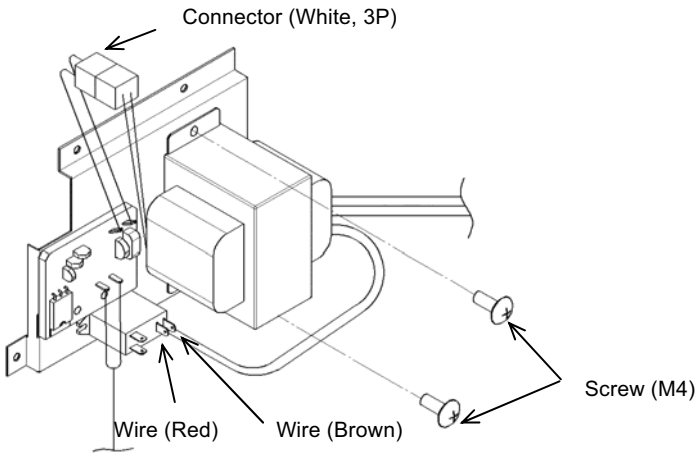
Plate meeting　Transformer　Lock and key　Water proof connector



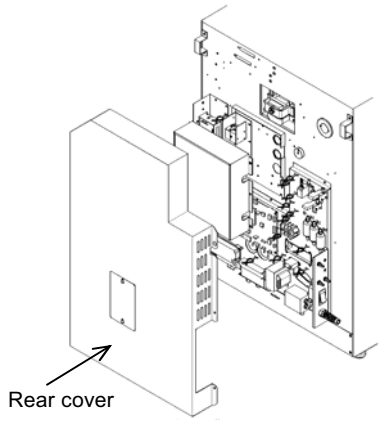
Name plate
Caution label

■Tools

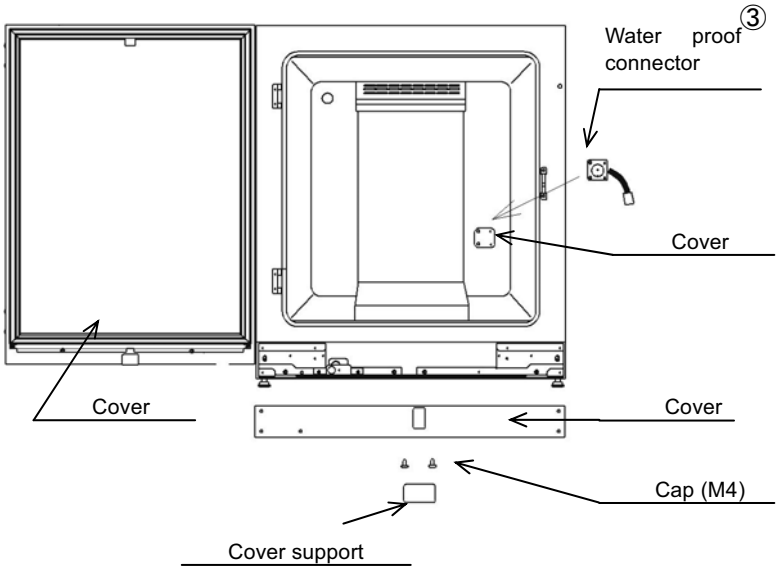
- Philips Screwdriver
- Wrench (8mm)



① Mount transformer on plate meeting and secure with screws (M4) and connect each wires (red and brown) to the places as left picture specified.

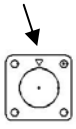


② Remove rear cover.

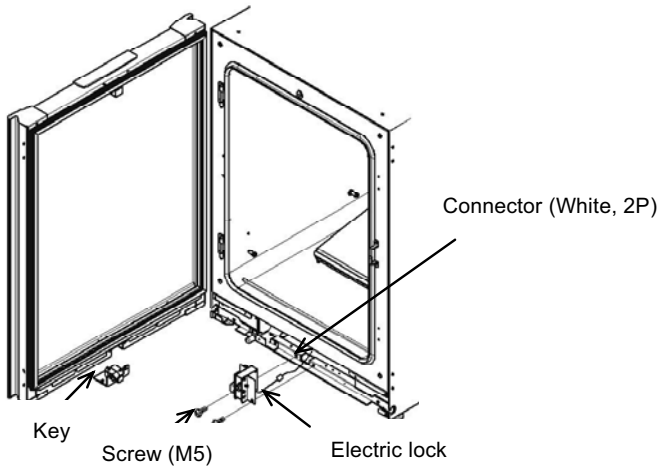


③ Remove rear cover of inner cabinet, 2pcs of cover under frame and cover inside door. Fit water proof connector to the place as left picture specified.

Note) Mark triangle should be oriented to upper position.

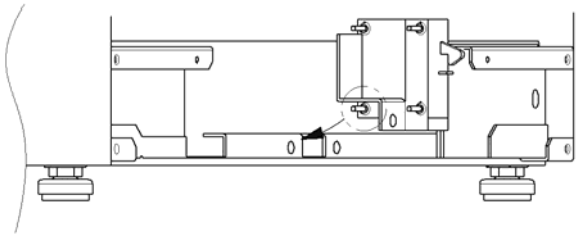


Apply 2 caps (M4) to the holes at cover support.

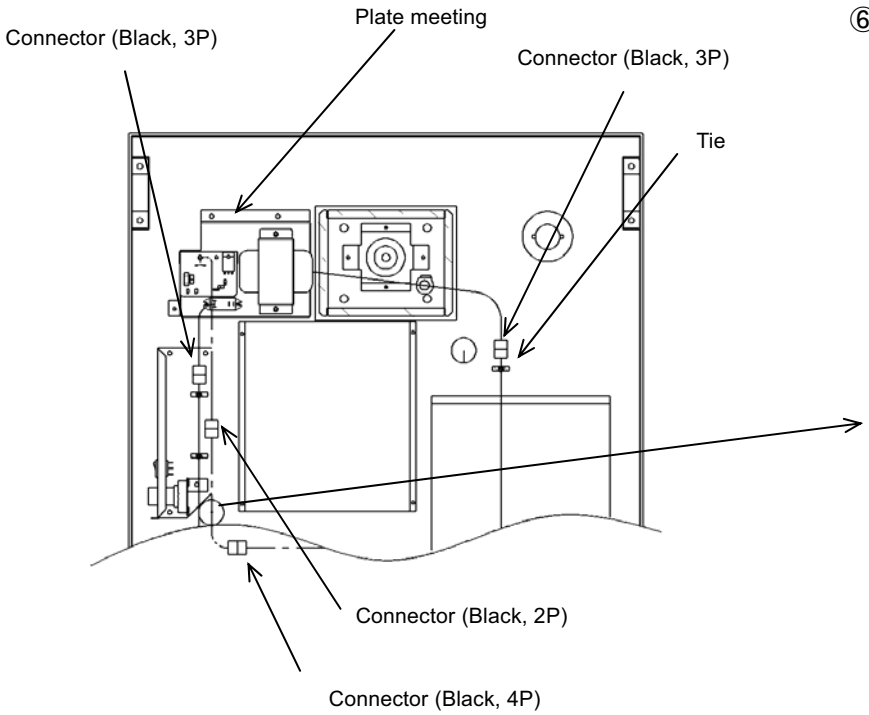


④ Connect connector for electric lock with connector (White, 2P) and fit to the angle. Fit the key to lower side of the door.

Note）Reuse screws removed to fit each parts. Electric lock should be secured by screws (M5).

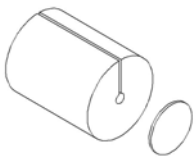


⑤ Recommended to fit electric lock first to the screw holes as arrow in the left picture pointed when you fit electric lock to the unit.

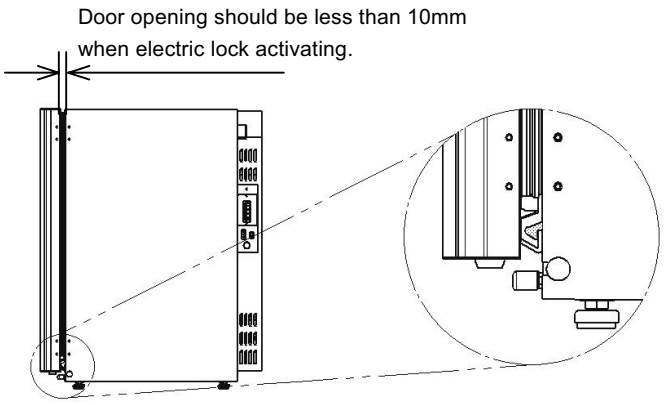


⑥ Fit plate meeting to the places as left picture specified and connect each connectors.

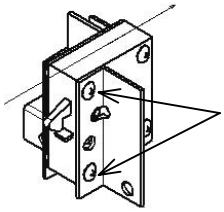
＊Harness for connector (Black, 3P) should be put thorough the tie.



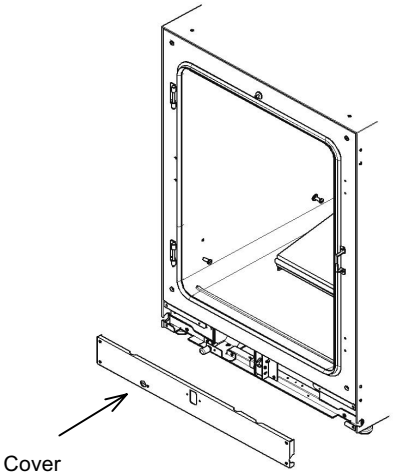
Peel seal off from insulation and fit the insulation back to original position.



⑦ Shut the door and ensure electric lock should be correctly functioned by using key. Electric lock does not activate when the power supplied. Ensure door opening should be less than 10mm when electric lock activates.
With outer door open, turn the key toward the direction to lock the door, you can remove the key from the door. The key does not turn with outer door closed.



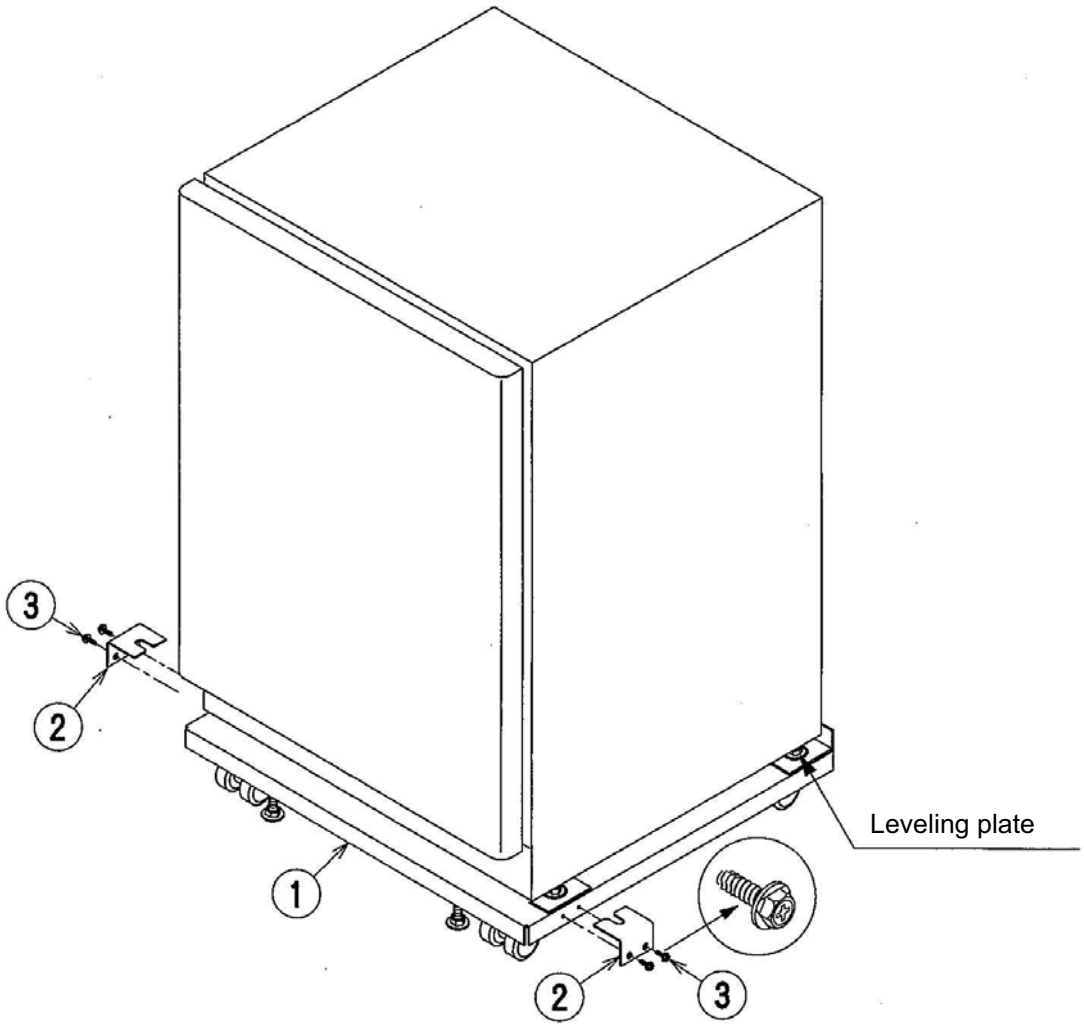
⑧ Align electric lock to hook correctly.



⑨ Fit the cover back under the frame.

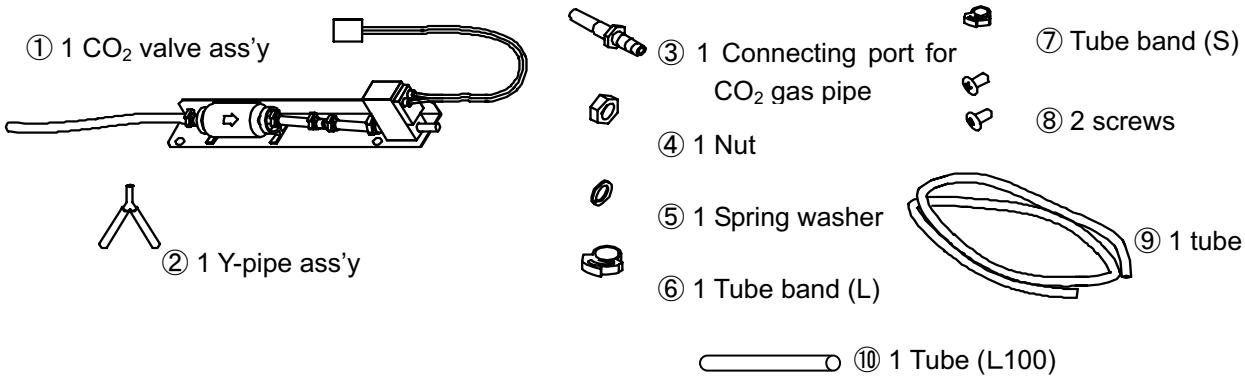
How to install Roller Base（MCO-18RB）

1. Align 4 pcs. of leveling plate on the Roller Base (①) to match them to each holes.
2. Fit the fixing metal（②） to each leveling plate and secure them by 2 screws（③）.



How to install Automatic CO_2 cylinder changeover（MCO-21GC）

Enclosures


① 1 CO_2 valve ass'y
② 1 Y-pipe ass'y
③ 1 Connecting port for CO_2 gas pipe
④ 1 Nut
⑤ 1 Spring washer
⑥ 1 Tube band (L)
⑦ Tube band (S)
⑧ 2 screws
⑨ 1 tube
⑩ 1 Tube (L100)

<Preparation>

1. Remote tube bands on CO_2 valve ass'y ① and remote hose and capillary.
2. Install the tube L100 ⑩ and fix the tube by the tube band removed in 1. Ensure tube band should be secured to prevent gas leakage.

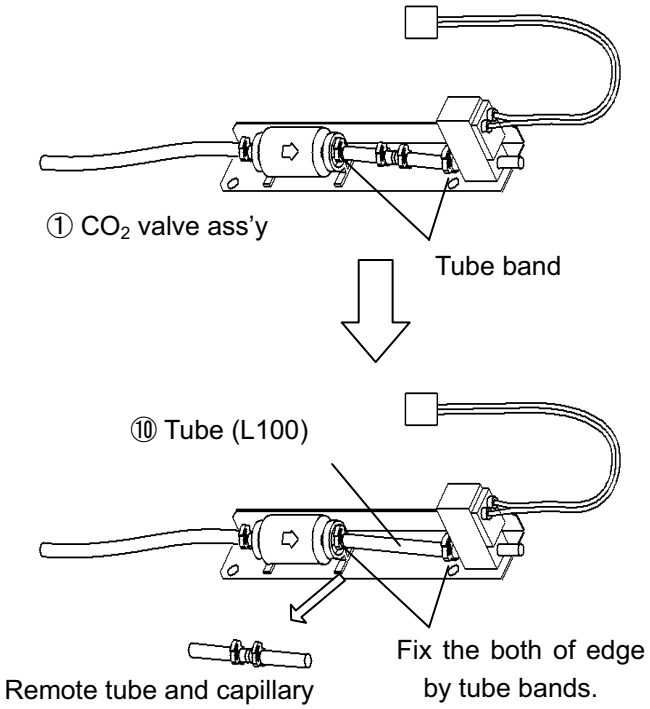
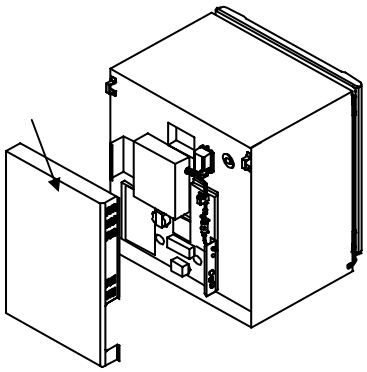


Fig.1

<Installation procedure>



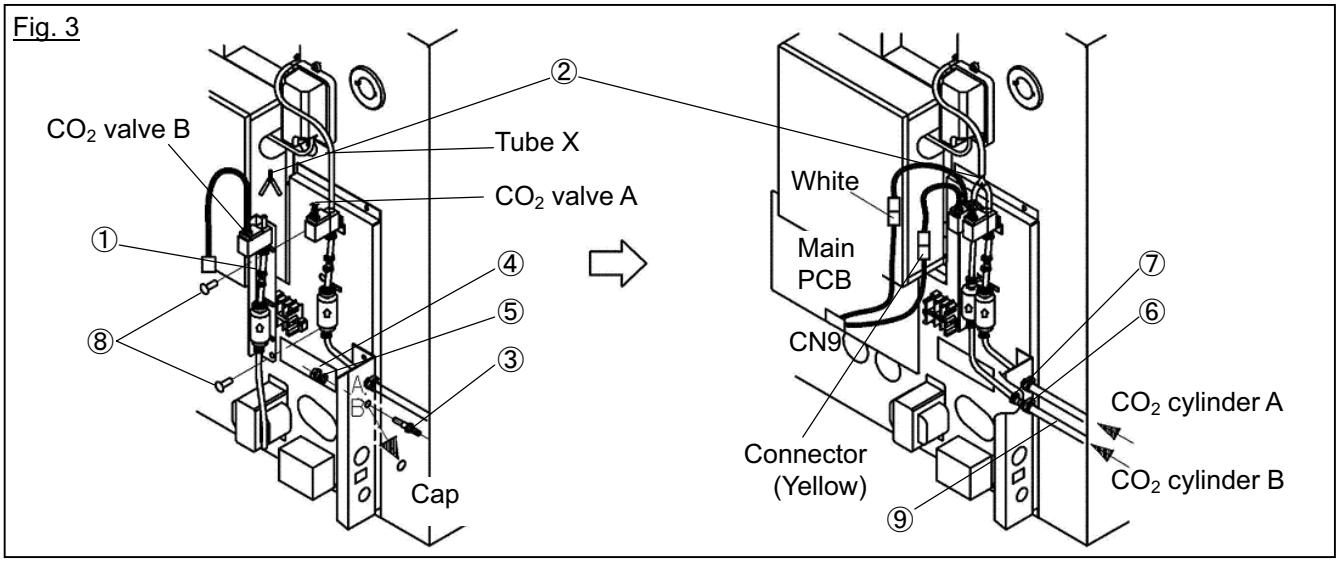
1. Disconnect the power cable and ensure that the power is not supplied.
2. Remove the rear cover.
3. Install CO_2 valve ass'y ① by 2 screws ⑧.
4. Remote the cap and fix connecting port③ by nut④ and spring washer⑤.
5. Connect the wiring harness of CO_2 valve B with connector (yellow) for wiring harness of CN9 on main PCB.
6. Disconnect upper tube for CO_2 valve A. Connect CO_2 valve A, CO_2 valve B and tube X by using Y-pipe ass'y ②. Refer to Fig. 3.
7. Connect lower tube for CO_2 valve ass'y ① with connecting port ③.
8. Connect CO_2 gas cylinder B with the port B ③ by using the tube ⑨.

9 Ensure to fix tube by using tube band (L)⑥ and (S)⑦. See Fig. 3.

10.Fit the rear cover back to original.

Note: Ensure all tubes should be tighten properly to prevent gas leak

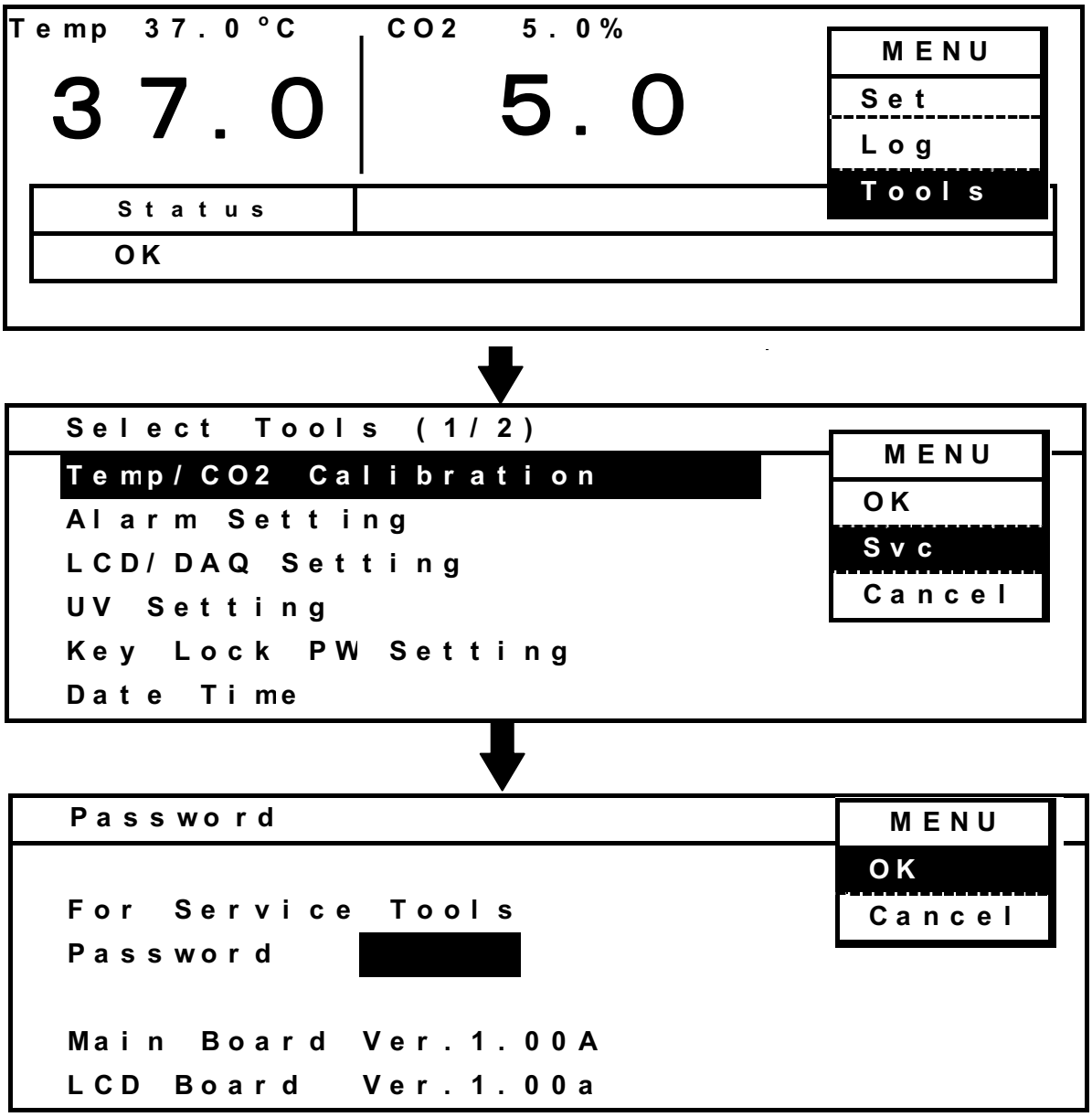
Fig. 3



How to activate Automatic CO_2 cylinder changeover system

When you activate automatic CO_2 cylinder changeover system, you should set the system in automatic mode.

<Service code input>

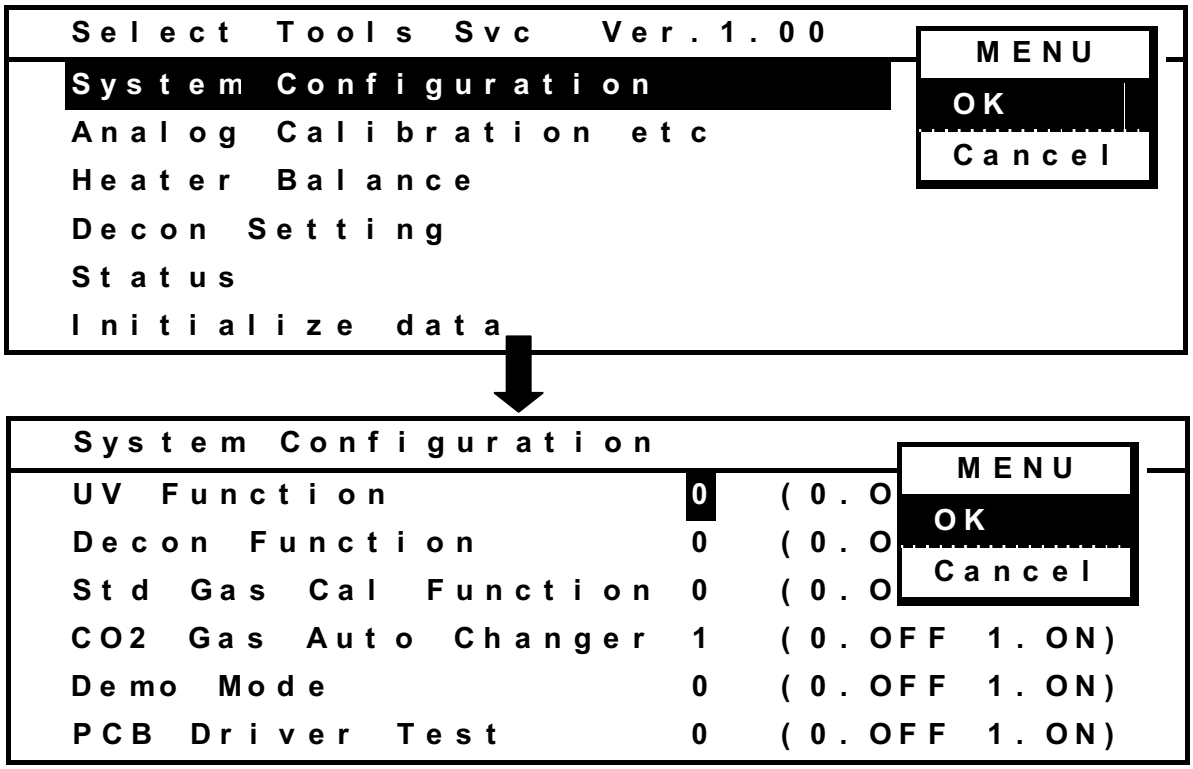


<Setting for service code>

You can check unpublished data if you input service code “384”.
In Top screen, serect MENU→Tools and MENU→Svc.
Press ENTER key to activate ‘Password’ screen’ and ”For Service Tools”/”Password ” is displayed.
Input ‘384’ then you can see unpublished data.

Note) Error tone emitted and the message ‘Wrong Password’ is displayed when you input service code incorrectly. You cannot change service code.

<Setting of Automatic CO_2 cylinder changeover system>



<Automatic CO_2 cylinder changeover system> (Default:0)

In Automatic CO_2 cylinder changeover system, 2 CO_2 cylinders can be installed in 1 unit and empty CO_2 cylinder is switched to another one automatically.

In Select Tools Svc screen, select ”System Configuration” and press MENU→OK(ENT) to active option setting.

When you input ‘0’ in the digit next to ”CO2 Gas Auto Changer” , Auto changer mode is inoperative. When you input ‘1’, Auto changer mode is activate. Current used cylinder alternative A or B turns over in Top screen. When a current used cylinder is empty, indication for its cylinder starts to blink.

How to check the operation

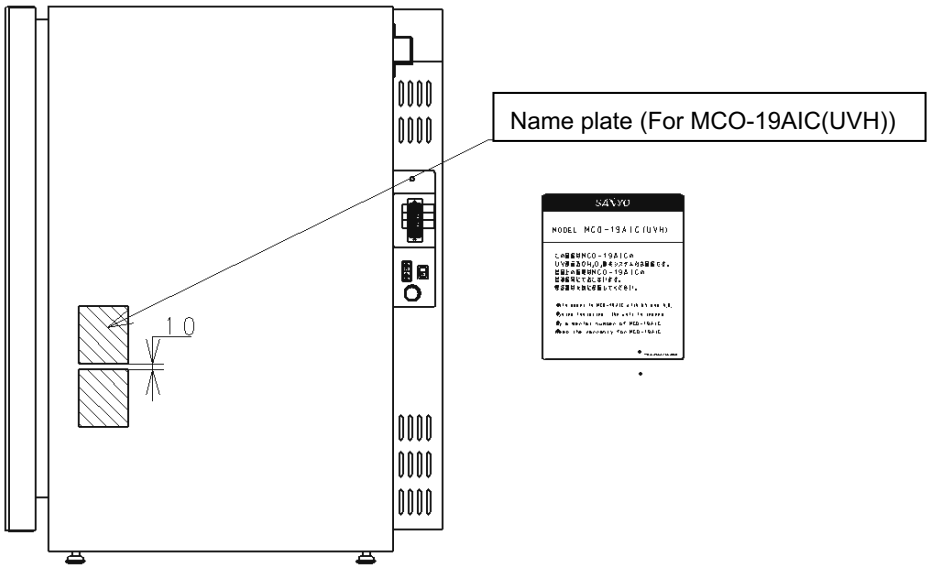
Check the operation at following procedure to confirm the MCO-21GC is correctly installed.

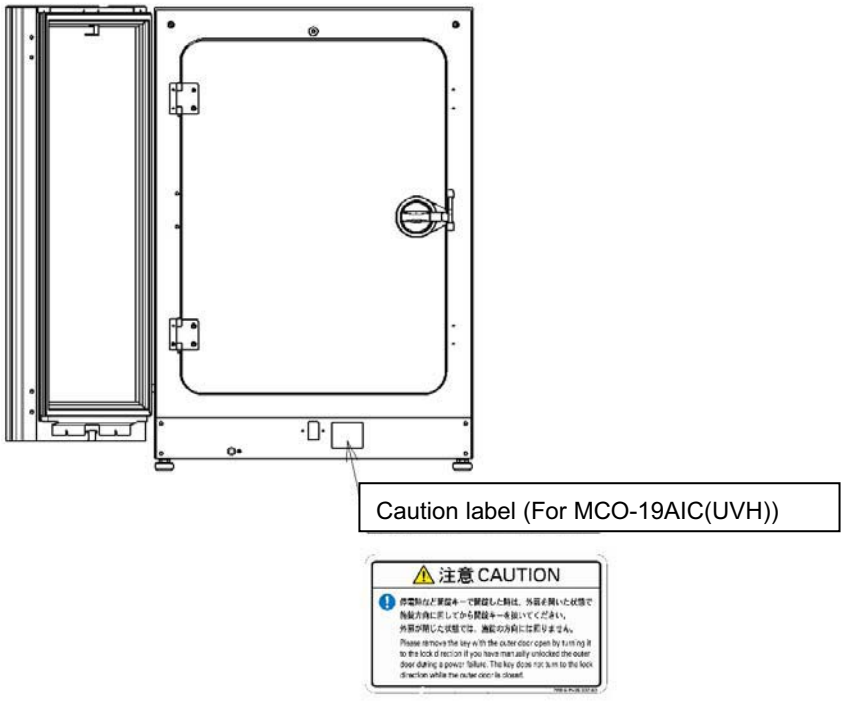
	Operation
1	Stop supplying the gas with cylinder A and supply with cylinder B solely.
2	Turn the power on and set temperature in 37.0℃ and CO_2 in 0.0%. Ensure cylinder A should be turned over.
3	Leave the unit for about 1 hour until chamber CO_2 is controllable.
4	Set CO_2 density in 5% and ensure the indication 'CO_2' should be turned over. Note) It may take 1 hour until the indication turns over in case low ambient temperature.
5	Check 'Err01 CO2 Gas Empty' should be displayed and buzzer emitted about 2~7 minutes later since the indication was turned over. Ensure CO_2 inject lamp A should be blink and lamp B turns over.
6	Ensure CO_2 density indication should be increased to 5% (set value) and CO_2 should be controllable correctly.
7	Operation check is completed. Stop gas supplying with both cylinder A and B. Press BUZZER key to eliminate the message "Error01 CO2 Gas Empty" and press the left side of cross key for 5 seconds to select cylinder A. Turn the power off.

* Refer to Instruction Manual of MCO-19AIC for the usage of MCO-21GC.

<Layout for Name plate and Caution label>

Put Name plate and Caution label on the following specified places.





How to install Automatic CO_2 Standard Gas Calibration kit（MCO-SG）

■Parts descriptions

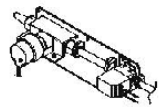
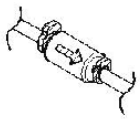
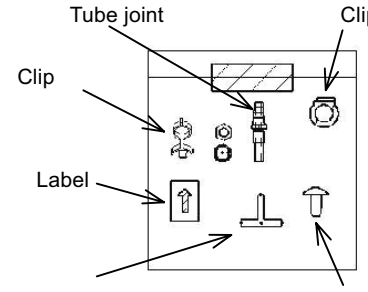


Plate meeting

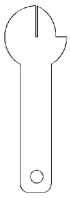


Filter

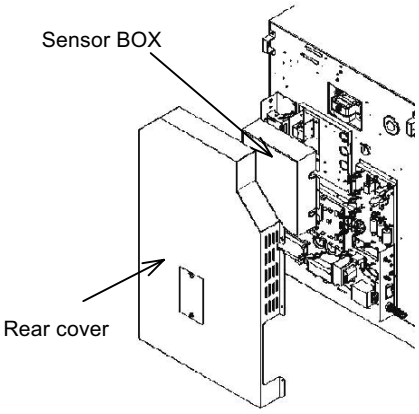


■Tools

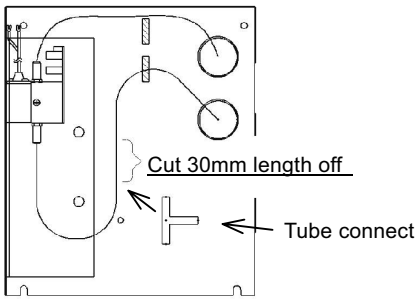
Philips screwdriver



Monkey wrench

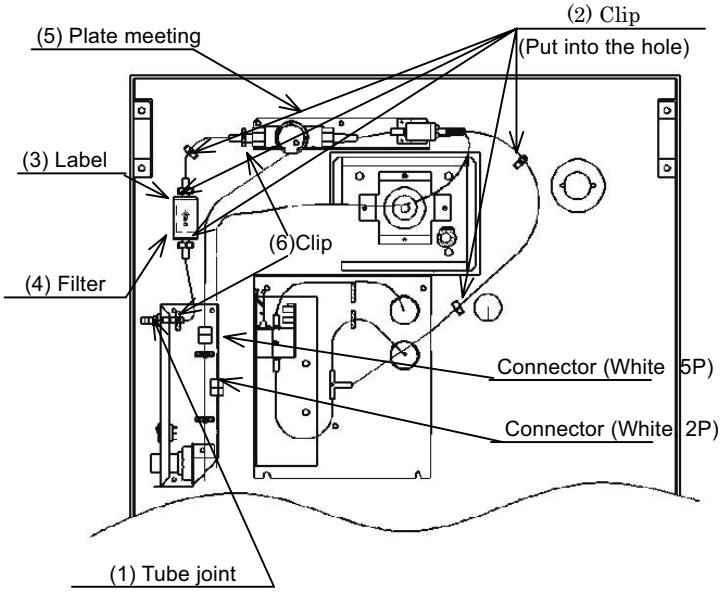


① Remove rear cover and sensor BOX cover.



CO_2 sensor BOX

② Cut 30mm off from the tube and fit tube connect to there as the left picture specified.



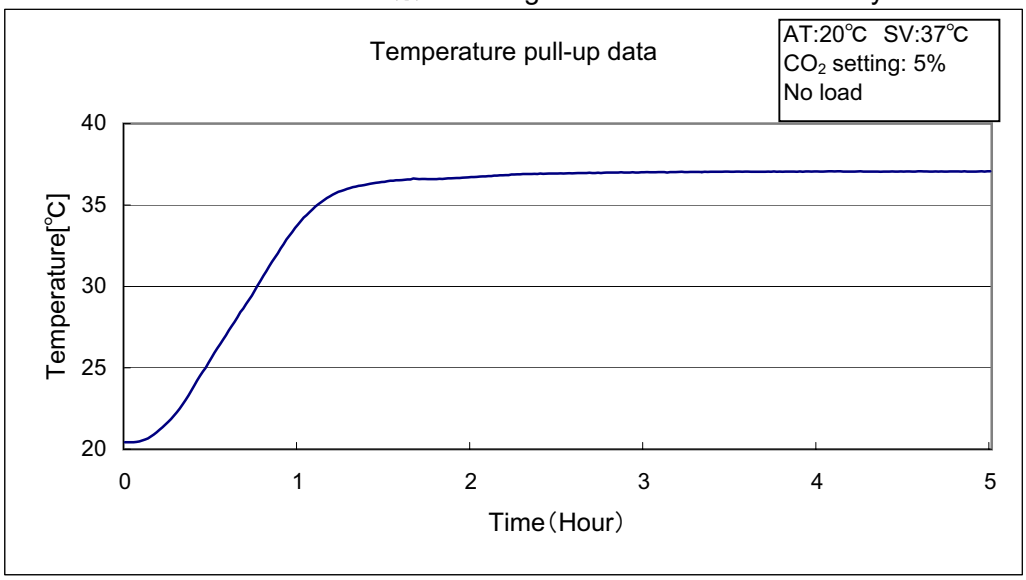
③ Follow the procedure (1)~(6).
(1) Fit the tube joint.
(2) Apply clips to the holes.
(3) Paste the label between clips.
(4) Fit the filter. Make sure the orientation.
(5) Fit the plate meeing.
(6) Apply clips as left picture specified.

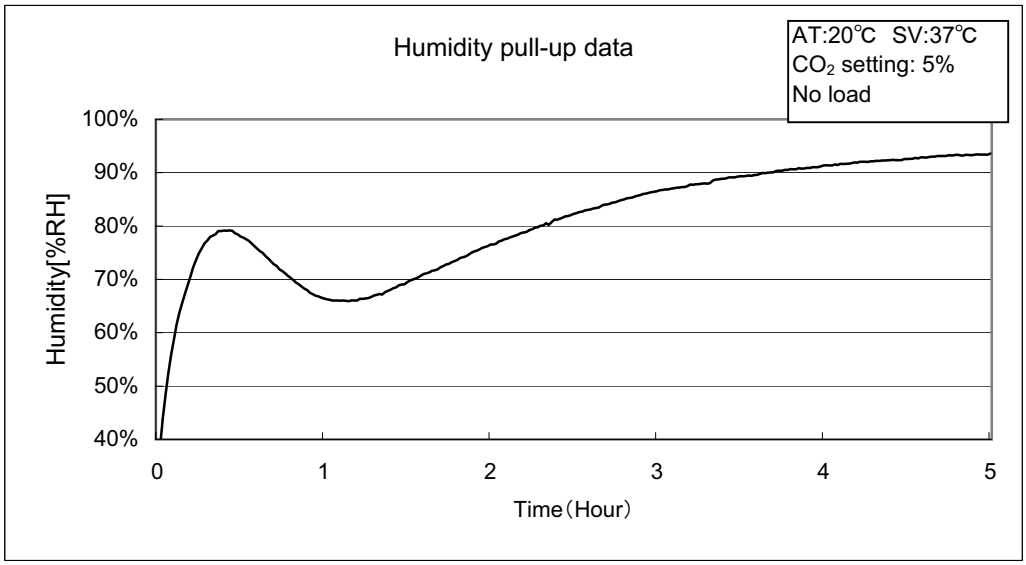
Place the tube as the left picture specified.
Note）Take care for the tube should not be bent.

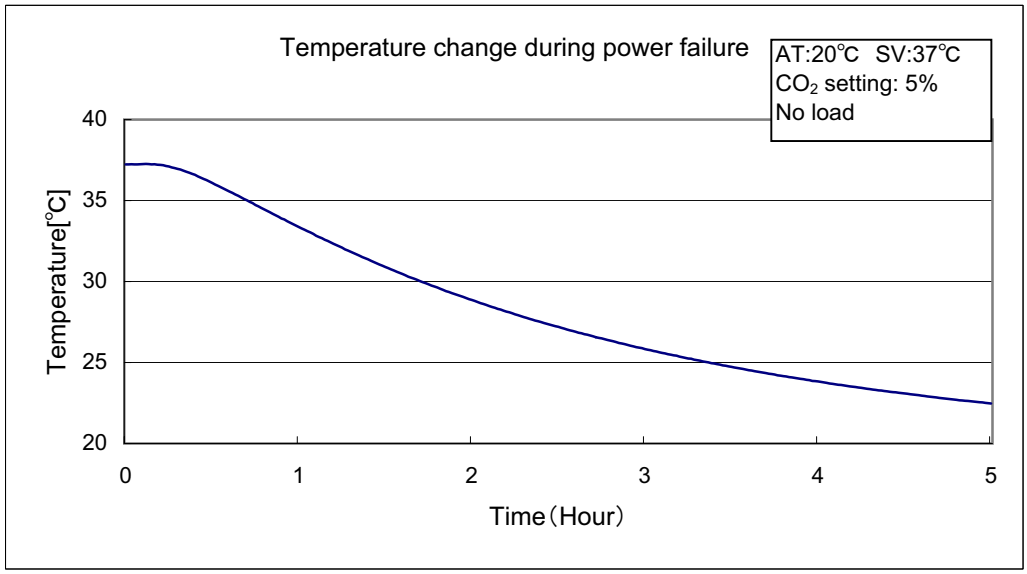
④ Connect each parts with connectors.

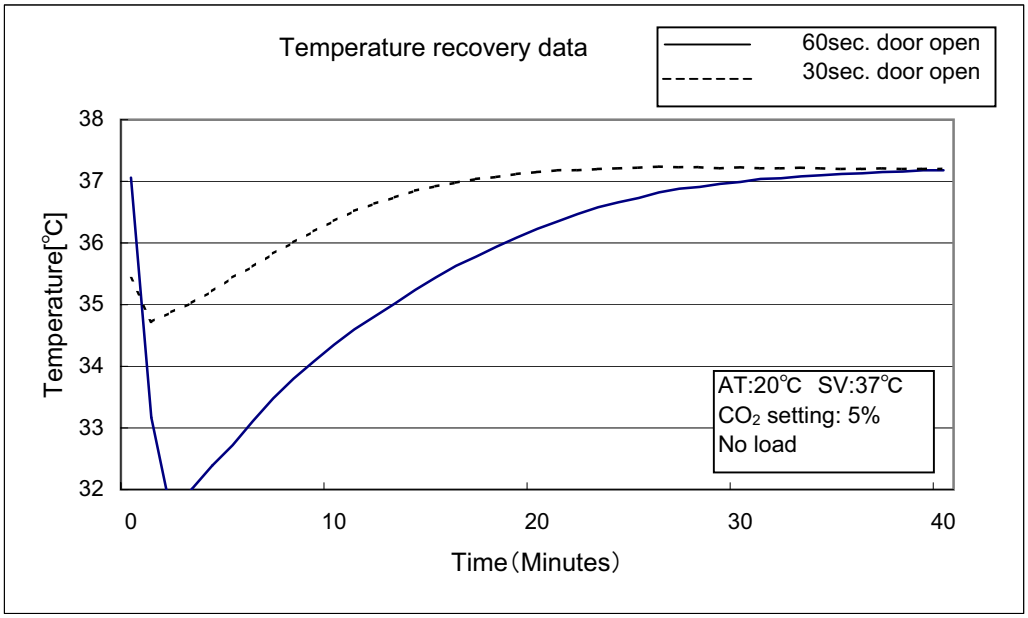
Test data

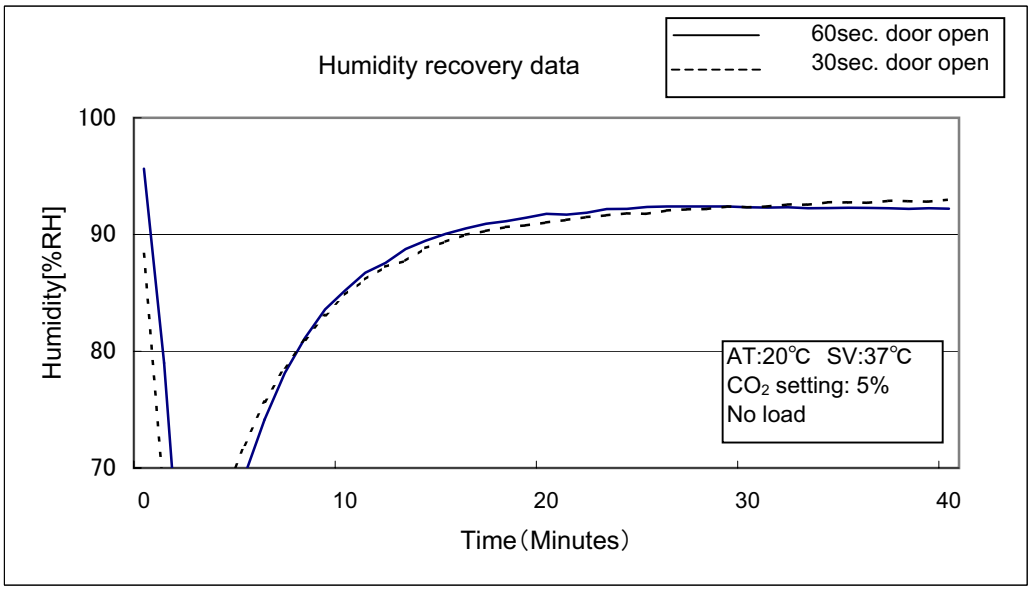
※Following data are the reference only.

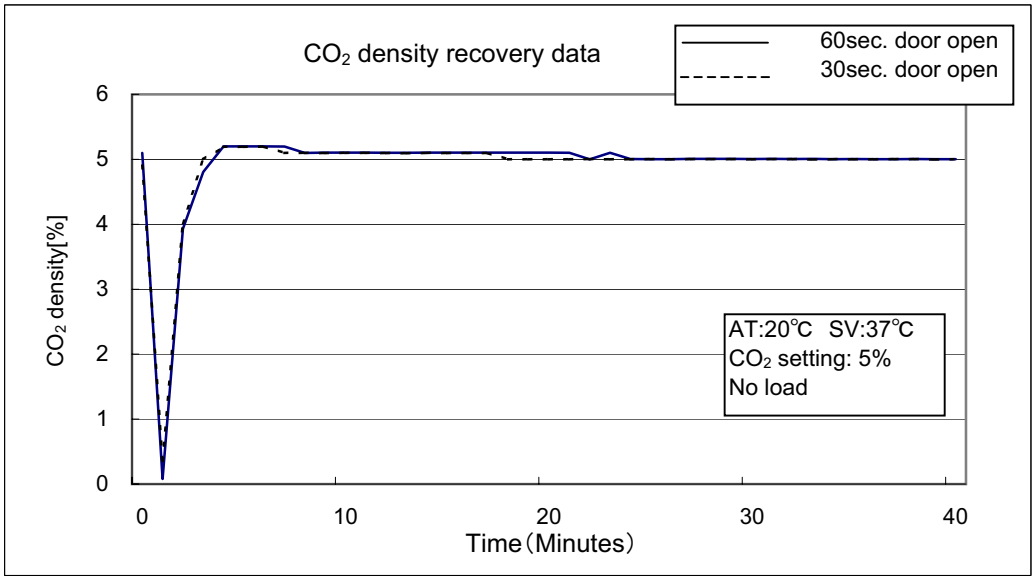


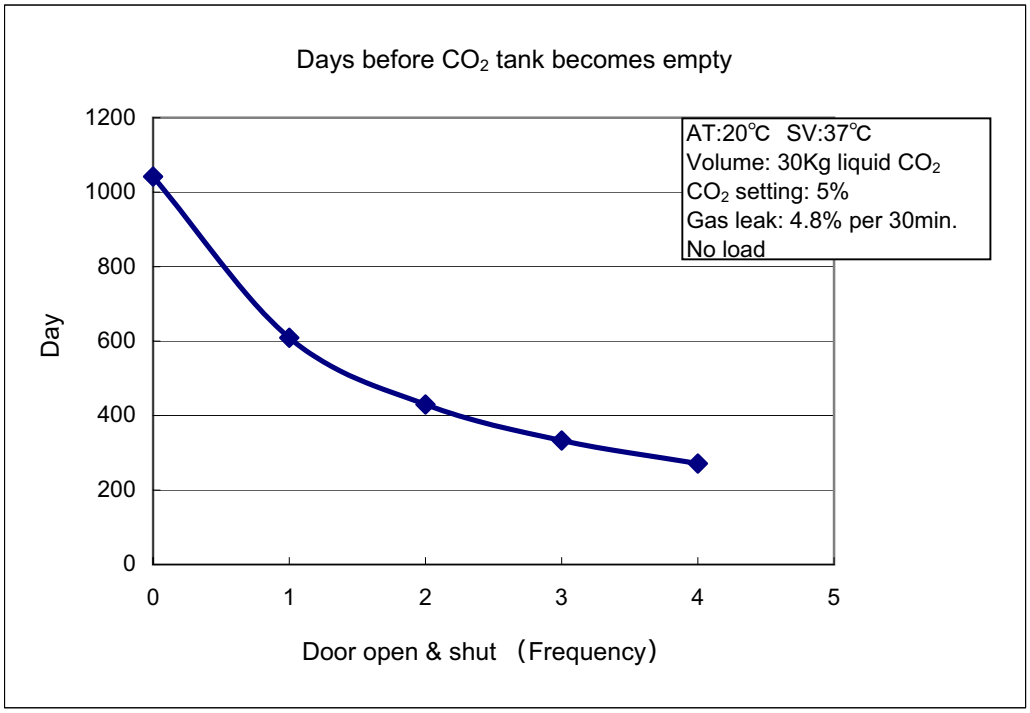





Temperature recovery data
60sec. door open
30sec. door open
Temperature[℃]
38
37
36
35
34
33
32
0
10
20
30
40
Time（Minutes）
AT:20℃ SV:37℃
CO2 setting: 5%
No load


Humidity recovery data
60sec. door open
30sec. door open
Humidity[%RH]
100
90
80
70
0
10
20
30
40
Time（Minutes）
AT:20℃ SV:37℃
CO2 setting: 5%
No load


CO2 density recovery data
60sec. door open
30sec. door open
CO2 density[%]
6
5
4
3
2
1
0
0
10
20
30
40
Time（Minutes）
AT:20℃ SV:37℃
CO2 setting: 5%
No load

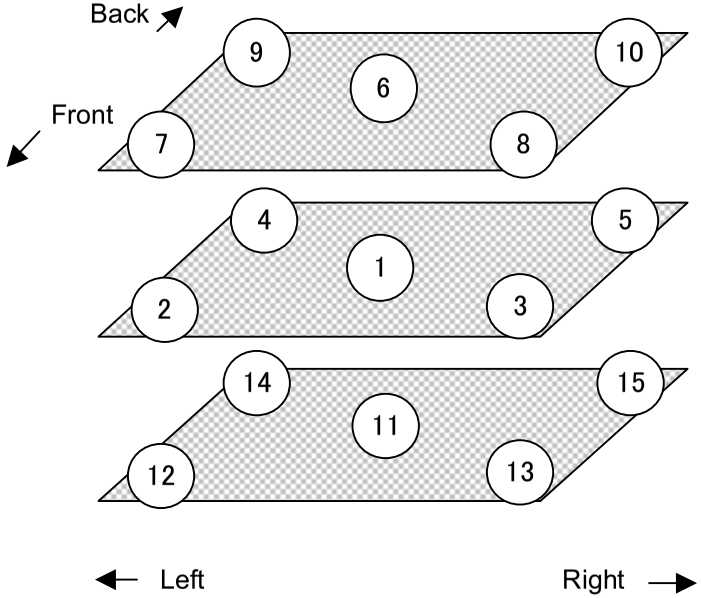

Days before CO_2 tank becomes empty
1200
1000
800
600
400
200
0
Day
0
1
2
3
4
5
Door open & shut （Frequency）
AT:20℃ SV:37℃
Volume: 30Kg liquid CO_2
CO_2 setting: 5%
Gas leak: 4.8% per 30min.
No load

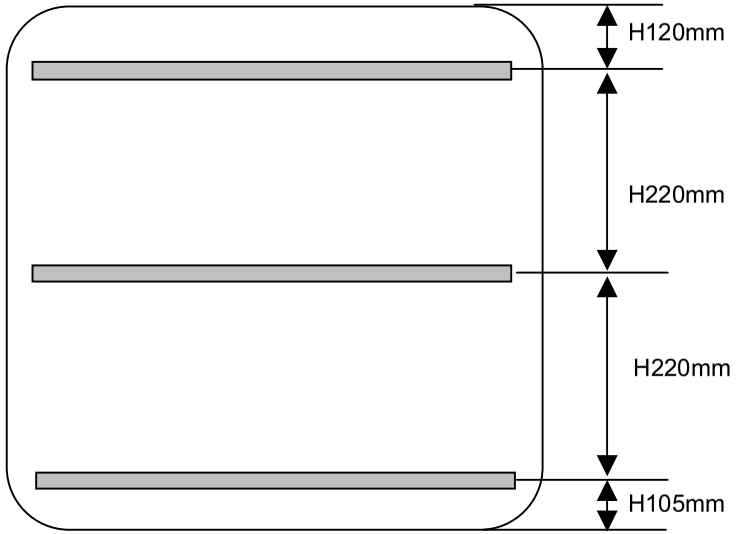
Temperature distribution data - 15points measured

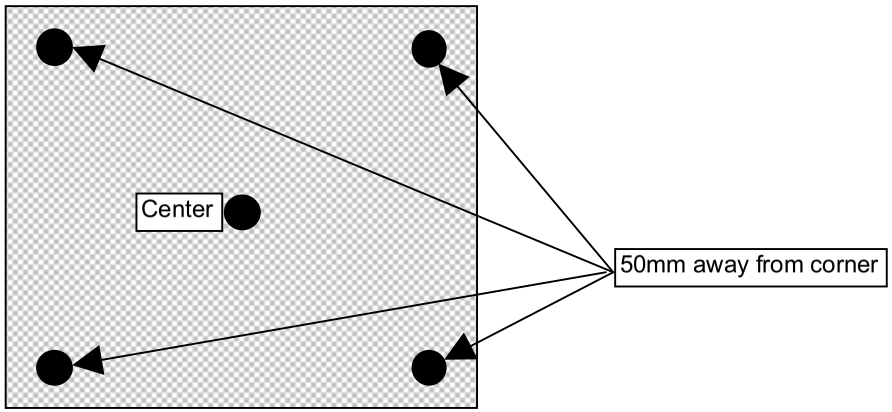
Measured point	Temp[℃]
1	37.11
2	37.04
3	36.90
4	36.96
5	36.83
6	37.13
7	37.10
8	37.12
9	37.07
10	36.92
11	36.88
12	36.95
13	36.81
14	36.94
15	36.79

* Data is the reference only.

<Measured points>







Condition

AT	20℃
SV	37℃
CO_2 setting	0%

Instruction manual

・This section is extracted and printed from Instruction Manual.

・If you find out “Refer to page ●●” in them, this page means not page in Service manual but page in the lower corner of each page in the extract from Instruction Manual.
This page number is not corresponded with serial number in Service manual.

・**Please note the extracted Instruction Manual which corresponds to the initial unit production, so the contents may be revised in future.**